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ABSTRACT

Autonomous learning, which implies the development of attitudes of responsibility and self-awareness related to thought processes on the part of the learner, is examined in the context of the organization and structure of the English public school system. Part 1 discusses autonomous learning and the way in which it may be developed in children from age 8 to 16. In Part 2, a description of the English public school system outlines the characteristics of the secondary schools and the age group clusters they serve. An explanation of the system of examinations and certificates used to measure students' progress is included. Part 3 presents a discussion on the learning environments at each stage of a child's schooling, with emphasis on the acquistition and development of autonomous learning behavior in children from 8 to 16 years. In Part 4, examples are presented of autonomous learning in selected English middle and secondary schools. Examples focus on the subjects of French, science, English, drama, technology, and design. Conclusions on the value of autonomous learning are offered in the final section. A bibliography is included, and samples of class activities which encourage autonomous learning are appended. (JD)

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Division of Structures, Content, Methods and Techniques of Education

ED-81/WS/64
PARIS, July 1981

The acquisition of autonomous learning behaviour in children from 8 to 16 years

V.M. Howe
T. Thomson

LIFE AT SCHOOL

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CONTENTS

		Page
I.	WHAT AUTONOMOUS LEARNING BEHAVIOUR IMPLIES	4
II.	EDUCATION IN ENGLAND	5
III.	DEVELOPING A LEARNING ENVIRONMENT	9
IV.	EXAMPLES OF AUTONOMOUS LEARNING	18
	1. The development of autonomous learning in French: 9-11 years	18
	2. The development of autonomous learning in scientific activities: 9-11 years	20
	3. The development of autonomous learning in English: 11-13 years.	23
	4. The development of autonomous learning in drama: 11-16 years.	27
	5. The development of autonomous learning in English: 14-16 years.	30
	6. The development of autonomous learning in technology: 14-16 years.	30
	7. The development of autonomous learning in design: 14-16 years.	34
V.	CONCLUSION	36
	BIBLIOGRAPHY	43
	APPENDIX I	44
	A report on part of an experiment measuring the effectiveness of three different approaches to learning	
	APPENDIX II	66
	(a) Design brief	
	(b) "Nets"	
	APPENDIX III	69
	(a) (b) (c) (d) Instructions for group games	
	(e) "Situation"	

ILLUSTRATIONS

		Page
1.	Types of schools and examinations in England	8
2.	Table showing organization of group activities for one day in a typical infant classroom	13
3.	Two children enjoying a quiet moment in the reading corner at High Cross J.M.I. school	14
4.	A display of clocks and their mechanisms at High Cross J.M.I. school	16
5.	Pupils at High Cross J.M.I. school trying out their burglar alarm	22
6.	Part of the entrance to High Cross J.M.I. school	22
7.	A selection of books written by pupils at Ralph Sadleir middle school	26
8.	Two boys checking through their work	26
9.	Two third year girls looking at their book	28
10.	Two fourth year boys explaining how they wrote their story . .	28
11.	Two fifth year boys using a pressure gauge at Simon Balle school	32
12.	A fifth year pupil at Simon Balle school testing his burglar alarm	33
13.	Table showing modules in fourth year creative design course .	35
14.	Example of a model incorporating the geodetic dome	37
15.	Examples of models made by fourth year pupils at Sheredes school	38
16.	Children playing a French board game	74

Studies and monographs on school life

On the occasion of the International Year of the Child, the United Nations Educational, Scientific and Cultural Organization promoted consideration on how to meet children's needs in those areas within its competence. In education, two complementary fields were explored: the child's right to education, and the pupil's right to a certain quality of life at school.

In the former connection, a work entitled The child's right to education was published as early as October 1979. It comprised contributions from experts throughout the world on three topics: the nature of the right to education, the extent to which it is really exercised, and its promotion. It makes no claim to offer a definitive formulation but rather offers normative elements and makes recommendations which can already be considered by the Member States.

It is not the same with the second field, related to the child's school life. Beginning with Living at school during the International Year of the Child, followed in 1981 by four monographs on the acquisition of independent learning behaviours by pupils from varying cultural contexts, consideration of school life will become richer as more and more contributions appear.

While looking into the conditions contributing to quality of life at school within the context of promoting the right to education, the combined Member States and the international scientific community should together work for the solution to this multidisciplinary problem, the relationship between the fulfilment of pupil per se and that of the physical, cognitive, affective and social development of the child.

Where Living at school aimed at identifying the principal variables in the concept of school life on the scale of Unesco's overall membership, each of the four monographs on acquiring the ability to learn on one's own treats these educational attempts in their national context.

Thus the present study analyses experiences in British schools. The authors, V.M. Howe and E. Thomson (United Kingdom) describe the entrance structures for British pupils, the corresponding examination system and the increasing adoption during the last 30 years of a child-oriented approach to education.

Member States can extract from these studies some elements of comparison with their own problems relative to quality of school life. In particular they will notice the need to adapt the experiences specifically for each of pre-school, primary or secondary schools. In the case of secondary schools, it would appear that the sharing out of a pupil's time among several teachers hampers the creation of an environment favourable to developing an overall "learning-on-one's own" behaviour pattern. In addition, the efforts recorded are sectoral, dealing with one subject matter only, e.g. French, the sciences, English, drama, technology drawing, etc.

The Secretariat wishes to express its thanks to V.M. Howe and E. Thomson for their contribution to "Studies and monographs on school life".

The opinions stated in the present work are those of the authors and do not necessarily represent those of Unesco.

I. WHAT AUTONOMOUS LEARNING BEHAVIOUR IMPLIES

Autonomous learning is concerned with the individuals' ability to have the freedom, opportunity and capacity to make a choice about what they learn and how they learn it. It is the development of an individual's capacity to initiate, organize and direct his learning and the way in which he takes on that responsibility for himself. It is part of the pursuit of knowledge, the need to know; the need to find out; the need to make meaning of both the immediate world and the world out there.

It could be said that human beings from birth onwards are directly involved in autonomous learning behaviour. The rate at which young children learn within the first five years of life is greater than at any other period. They learn to move, to communicate through gesture and speech, to explore and make sense of the world around them. What is remarkable about this phase of learning is the painless way in which it is acquired. Young children learn to walk and talk without any apparent effort on their part. They not only respond to the world around them but they also initiate as J.S. Bruner (1976)(1) has shown in his research on prelinguistic communication between mother and child:

> "...it would seem that at the start there is a strong push present in the infant to share features of the sensory world with the mother and an equally strong push for the mother to orient to the features of the world to which the child is attending". (p. 66)

What is also significant about this stage is that it is assumed by everyone else that children of this age will learn to walk and talk without difficulty, there is no expectation of failure.

If autonomous learning is concerned with individuals taking on responsibility for their own learning then they must develop a consciousness of what is involved in the learning process. Vygotsky (1962)(1) says "control of a function is the counterpart of one's consciousness of it". Indeed it could be said that the more we are in control of our thinking, the more we can learn. We build up a network of relationships between our existing knowledge and between that we wish to know. The acquisition of such consciousness is part of a developmental process. Autonomous learning behaviour does not imply a state to arrive at. It is not an end in itself, but is a description of a process, which starts from birth onwards. A process which is related to both cognitive and effective growth. It is the development and refinement of what J.S. Bruner (1966)(1) describes as:

> "... the natural energies that sustain spontaneous learning - a curiosity, a desire for competence, aspiration to emulate a model, and a deep commitment to the web of social reciprocity". (p. 126)

If we are concerned in schools with starting from where children are, by using the knowledge that they already have of the world as a starting point, then it would be sensible to build on those "natural energies that sustain spontaneous learning".

In this study we shall be looking at the way in which autonomous learning behaviour can or cannot be developed within a structured system from the ages of 8 to 16 years. Before we go on to look at individual case studies, which, we believe, can be seen as part of the process of developing autonomous learning

(1) See Bibliography for further details.

behaviour; we shall first describe the English schools and examination system and will make particular reference to the way that Public Examination Boards have evolved a framework which is now starting to reflect the increasing collaboration between teachers and pupils about the content and structure of examination. Secondly we shall look at the way that learning environments are developed within the different stages of schooling. Our conclusion will be concerned with the relative merits of this way of learning.

II. EDUCATION IN ENGLAND

It would seem relevant to include a few brief notes concerning the education system in England in order that the examples which follow can be seen in their true context. Primary education indicates education for children under the age of 11 years, secondary from 11 years upwards.

Compulsory schooling in England commences when the child attains five years of age. He/she will enter either:

an infant school, 5-7 years
a junior mixed and infant school termed J.M.I., 5-11 years
or a first school, 5-8 or 9 years

The infant school receives children from 5-7 years of age. Children are then transferred to a junior mixed school termed J.M. and stay there to the age of 11 years.

The junior mixed and infant school receives children from 5-11 when they are transferred to a secondary school.

The first school receives children from 5-8 years of age. Children are then transferred to a middle school which bridges the primary and the secondary age range.

It is very rare that schools covering the early years are single sexed as the names imply J.M. junior mixed, J.M.I. junior mixed and infants. There are not often more than 250 children at an infant or first school or 350 at a J.M.I. or middle school.

These different types of school exist side by side within a county, an example of which is Hertfordshire. They have been planned to best meet the educational needs of the children in any given area. They ensure that the children are taught in viable numbers and that the best possible use is made of suitable school buildings. J.M.I. schools usually exist in country areas to avoid the creation of two very small schools which would limit the material provision for the children. Whereas in towns children entering school will mostly attend an infant school followed by a J.M. school. First schools developed in the early 1970s after the Plowden Report (1967) (1) in compact or self contained areas in order to provide the best possible educational opportunities by using in a different way the resources available. For some years many educationalists had been dissatisfied with the break at 11 years from primary to secondary education. The introduction of first schools to be followed by middle schools bridging the gap between primary and secondary education led to a new philosophy. Ideas involving the autonomy of the child which had already been developed in the early years of learning could now be taken on beyond the age of 11 years. In primary education, whatever the school, children of all abilities learn together.

(1) See Bibliography for further details.

Secondary education for children from the age of 11 years takes place in the following:

Middle school	8-12 years of 9-13 years
Upper school	12-18 or 13-18 years
High school	11-16 years
Sixth form college	16-18 years
Comprehensive school	11-18 years

The middle school

The teaching methods and techniques, involving individualized learning and group work in a stimulating environment, which had been envolved for primary children were now continued through the middle school years. Some specialist teachers for subjects such as French have joined the staff of middle schools, but on the whole the children are taught several subjects by the same teacher. This and the small size of the school, 350 pupils, makes for a closer knit community with more support for the individual child. Children of all abilities attend the middle school. There is sometimes a degree of setting according to ability in the last two years for subjects such as maths and French.

The upper school

Usually three or four middle schools send children of all abilities to an upper school. There need to be good liaison between middle and upper schools especially with regard to French, maths, and other sequential subjects. Upper schools can receive from 550-1,200 pupils. They leave at either 16 or 18 years.

High schools and sixth form colleges

High schools receive pupils of all abilities from J.M. or J.M.I. schools; they vary in size according to the area but usually take a minimum of 500 pupils. Pupils are usually taught in mixed ability classes for year I but are mostly divided into ability sets for some subjects from year II. Many pupils leave at the end of their high school years. Others continue usually following an academic programme at a sixth form college.

It is thought by some administrators and educationalists that the best provision for pupils aged 16-18 years can be made by sixth form colleges. They argue that a larger range of subjects with better qualified teachers can be offered; but this view is not held by all, many are of the opinion that the older pupils 16-18 years have a vital contribution to make to the life of a secondary school.

Comprehensive schools

Pupils of all abilities enter a comprehensive school usually from J.M. or J.M.I. schools. They are taught in mixed ability classes for year I but as in the high school they are usually put into ability sets for some subjects from year II. Pupils can leave the comprehensive school at either 16 or 18 years. The size varies from 700-1,500 pupils or more.

Within an area, county, or the country as a whole, these types of school exist side by side, it is not uncommon for pupils to move from one to another. For example a pupil could start at a first school at 5 years old, move to another area

of a county and attend a J.M. school, transfer normally to an 11-18 comprehensive school, move again at 14 years and return to the original system and enter an upper school having missed attendance at a middle school. Most schools receiving pupils of secondary age are mixed boys and girls, although a few are single sexed.

The schools described are those which are most commonly found in England today and examples of autonomous learning have been found in a number of those listed. However it should be emphasized that the provision of education for children is the responsibility of each local education authority. There are variations in the age groupings, size of schools and terminology used to indicate the type of school. In some counties the first school is referred to as the lower school. There are also in some areas grammar schools which receive the most academic pupils. Only a minority of pupils are educated in these schools and as examples of autonomous learning have not been taken from this type of school, reference to them on the following chart has been omitted.

Examinations

There are no examinations for pupils attending schools during their primary years. At the secondary stage most pupils are entered for public examinations at 16 years and some later at 18 years.

In most secondary schools pupils aged 11 to 14 years follow a planned curriculum in the different educational establishments described. Then with the guidance from parents and teachers, pupils select from a wide range of subjects those which they will study for a further two years before taking a public examination.

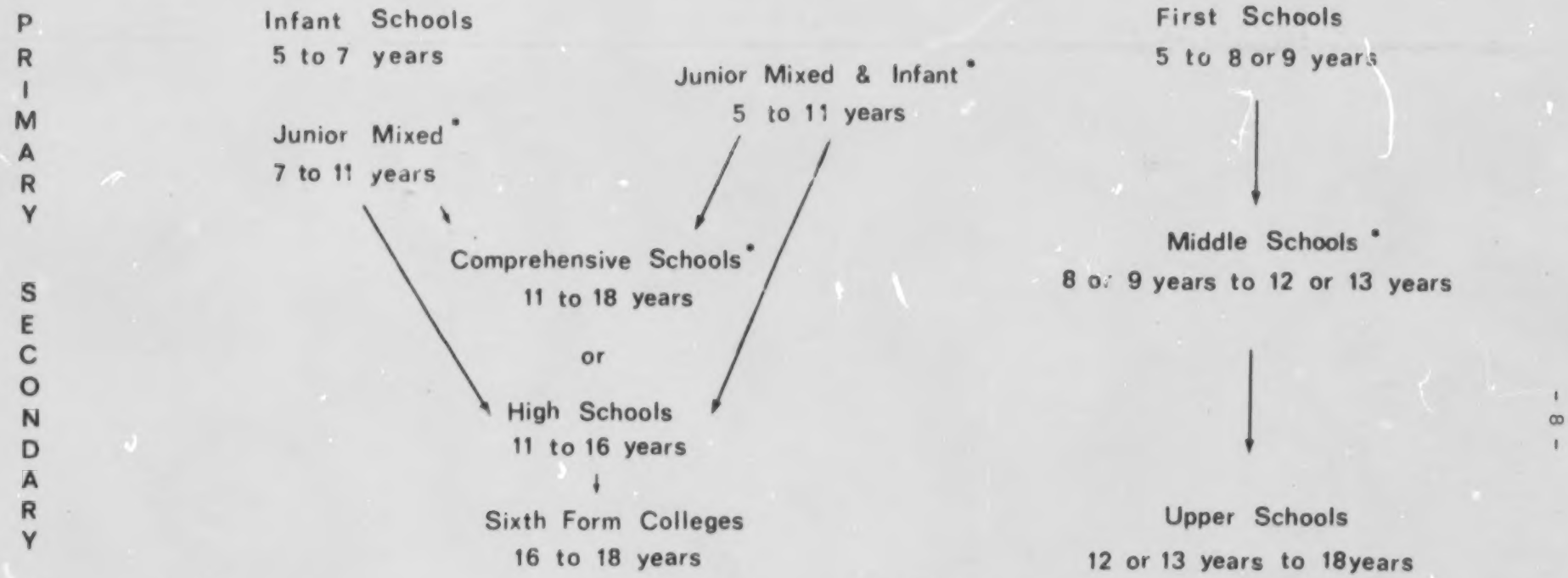
Pupils aged 16, usually enter for either the Certificate of Secondary Education (C.S.E.) or the General Certificate of Education (G.C.E.) Ordinary level, usually referred to as O level. Many pupils leave school at this stage for the world of work. Pupils aged 18 who continue with their education take the General Certificate of Education (G.C.E.) Advanced level, usually referred to as A level. All these C.S.E., O level, A level, are single subject examinations. A pupil may take one or two subjects at O level and other subjects at C.S.E. according to his relative strengths in different subjects.

Certificate of Secondary Education (C.S.E.)

This came into being at the insistance of teachers who believed that an alternative system was necessary to make provision for pupils of a wider range of ability than the O level examination. They realized a scheme which enabled teachers to cater for the different needs of pupils within the context of individual schools and which is largely handled by the pupils' teachers. This is usually but not always taken by pupils who are not academically inclined, there is always a practical bias to the syllabus to be followed involving project work. There are three types of C.S.E. examinations. Modes 1 and 2 are conventional public examinations with exam papers set by the Examining Board. In the case of Mode 3 the syllabus can be drawn up by the teachers in a single school, or the teachers from a group of schools. The interests of pupils in the individual schools can then be borne in mind. The examination papers too are prepared by the teachers. This type of examination allows for greater latitude and autonomy in learning to be given to pupils. The syllabus and examination papers are submitted for the approval of a recognized "Board" which consists of highly qualified and experienced educationalists. The actual examination scripts are marked by the pupils' teachers but are then moderated by one or more examiners appointed by

Types of Schools and Examinations in England

SCHOOLS



*Types of schools referred to in this Report.

EXAMINATIONS

High Schools	G.C.E. O level, C.S.E.
Comprehensive Schools	G.C.E. O level & A level, C.S.E.
Upper Schools	G.C.E. O level & A level, C.S.E.
Sixth Form Colleges	G.C.E. A level

G.C.E. = General Certificate of Education
O level = Ordinary level
A level = Advanced level
C.S.E. = Certificate of Secondary Education

the "Board". The C.S.E. examination always contains one or more projects which allows for autonomous individualized learning and a number of instances by pupils preparing for this examination are described in this study. The worth of the projects is assessed by the teacher and moderated by an examiner. In a Mode 3 C.S.E. the project work carries from 30-50 per cent of the total marks depending on the subject and the importance of individual topic. This percentage is decided by the teachers preparing the syllabus.

Ordinary level (O level)

In the past the preparation of the syllabus and examination papers was handled by a "Board" of highly qualified educationalists under the aegis of a university. However in recent years there has been a move by some of the "University Boards" to follow the example of the C.S.E. examiners by making provision for more teacher involvement. Some "University Boards", e.g. A.E.B.,(1) J.M.B.(2) allow suggestions of work to be undertaken for inclusion in the syllabus: see Turnford school, autonomous learning through English.

Although most O level examination papers are still set by the "University Boards" and marked by examiners appointed by them, whole or part continuous assessment is also allowed in some cases.

Advanced level (A level)

Following a further two years of study after the O level examination pupils may take between one and four A level examinations in subjects of their choice. However most pupils take two or three subjects only as required for university entrance. The syllabus and examination papers are set by the "Boards" nominated by a university and examination scripts are marked by examiners appointed by them.

In common with the O level examination there is currently some positive moves by more than one "Board" towards more teacher and pupil involvement in the preparation of the syllabus to be followed. J.M.B.(2) has already introduced continuous assessment in English with no final examination.

From 1981 Cambridge is proposing continuous assessment for creative writing which will cover 50 per cent of the total marks. These are all very positive steps and we may well see in the future all examinations being suited to the pupils instead of the pupils being suited to the examinations.

III. DEVELOPING A LEARNING ENVIRONMENT

Perhaps one of the most significant developments in the English educational system in the past thirty five years has been the way in which classrooms have changed. That change reflects the change in the role of the teacher; for with the introduction of more child-centred approaches to teaching and learning there has been a greater emphasis on developing a stimulating learning environment within both the individual classroom and within the school as a whole. The typical primary class-room no longer has desks set out in serried rows facing the blackboard at the front, nor does the teacher deliver his or her lesson in the traditional pedagogic style. Children are not all involved in the same activity at the same

(1) A.E.B.: Associated Examining Board.
(2) J.M.B.: Joint Matriculation Board.

time and are not all working at the same level. This is because allowance is now made for the different ways in which children learn - far more emphasis is laid upon developing children's strengths and starting from what they have to offer. It is assumed that all children start school with a stock of knowledge which they have acquired in their first five years; for as James Moffett (1968)(1) so rightly says:

> "A child is not an empty vessel when he enters school; he comes replete with a set of abstractions about the world and himself, some of which he may have acquired ready made from others, but some of which he generated himself from his own experience". (p. 215)

We need then to examine the kinds of experiences that children are offered in school which enable them to add to and develop their existing stock of knowledge.

To do this we feel that it is necessary to examine learning environments at each stage in the child's schooling, although our brief is to look at the acquisition and development of autonomous learning behaviour in children from 8-16 years. For if we believe that learning is a developmental process then it is important and necessary to look at the way that environments for learning are developed from the earliest stages of schooling.

1. Nursery-infant stage: 4-7 years

It would be fair to say that virtually all infant schools or departments provide inviting and interesting learning environments. Children are given a wide range of opportunities to learn through experience and great value is laid on the importance of play as a means of exploring and trying out new experiences. Vygotsky (1976)(1) saw play as "the imaginary, illusory realization of unrealizable desires", and D.W. Winnicott (1971)(1) believed that "on the basis of playing is built the whole of man's experimental existence".

A typical infant classroom has various areas designated for different activities e.g. there is usually a reading/language area which is often carpeted, with cushions and easy chairs to encourage the children to sit and browse through the many books which will be available. These will range from picture books with or without words, to nursery rhymes, riddles, folk fairy tales, information books plus a variety of reading schemes and other supplementary reading materials. There will also be pictures and objects to look at and talk about. It may well be that the teacher uses this area as her base, for it is unlikely that she will have a desk, as the emphasis will be on creating a secure framework and building a warm relationship between teacher and children out of which learning can develop.

There will also be a mathematics area where all the mathematics apparatus and equipment such as metre measures, trundle wheels, tape measures, different types of weighing scales, capacity measures, number games and abaci are kept. A great deal of improvization goes on as far as the use of equipment is concerned and children are encouraged to use and bring in objects such as cotton reels, egg boxes, containers of different sizes and shapes for sorting, grouping and matching activities. This sort of environment encourages young children to develop a great deal of concrete experience through playing with mathematics apparatus before they begin to record and write down numbers in a more abstract way. Through their play they are encouraged to hypothesize and try out different possibilities - it is

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(1) See Bibliography for further details.

the "I wonder what would happen if..." sort of question which, given the opportunity to experiment, provides a starting point for enquiry based learning. Children are encouraged to formulate their own questions; although they often need help and guidance from the teacher to enable them to sustain and develop a line of enquiry into a meaningful learning experience.

Inevitably there will be an overlap between maths, science and environmental activities. Infant teachers are concerned to make their classrooms interesting places and often enlist the children's help in doing this, by encouraging them to bring in things of interest from the out of school environment. A common feature of many primary classrooms, both at infant and junior stage, is the interest table which is usually a displayed collection of objects brought in by individual children. These objects provide both a talking point and often a starting point for learning related to the child's own interests and experience.

There is usually a large, specially equipped area for art/craft activities with easels, paint pots, brushes, paste, a variety of paper and materials for collage work, wood and other junk material and a clay area. Many primary schools are equipped with kilns so that pupils can have their clay work fired and glazed if they wish. Children are encouraged to express themselves through a variety of media and are often able to record their observations in other aspects of the curriculum in this way.

As was said at the beginning of this section a great deal of importance is attached to the need for, and value of, play. All the areas so far described are areas where children will have the opportunity to play with and try out different modes of learning. However there will also be areas within the infant classroom specially designated as play areas where young children will have the opportunity to experience playing with sand and water as well as the more traditional Wendy house, which is usually equipped with dolls and clothes for the children to dress up in and involve themselves in dramatic play.

The infant teacher is concerned with developing a whole range of experiences and concepts for children at this stage. Because of this, children work in groups at different activities throughout the day. The choice and direction of what they learn and how they learn it will be determined by the teacher who organizes the day so that each group of children experience a balance of activities throughout the day,e.g. mathematics, reading, writing, story, art and craft activities. Certain activities such as story, music, PE and drama will involve the whole class working together. The teacher uses these times to foster peer group relationships and to develop attitudes of responsibility towards each other. Although the children are working in groups, they often pursue different activities individually; for at this stage very little collaborative learning occurs. However signs of this sort of development may begin to occur in co-operative work in art and craft and in dramatic play where children are relating to each other and working together towards a common goal. On the page 13 is a table which indicates the organization of a typical day in an infant school. The way that children are grouped will vary, sometimes it will be according to the age of the pupils, for it is not unusual to have classes with more than one age range in the infant school; and in other situations it will be according to attainment in reading and number work.

The table shows the organization of <u>one</u> day in an infant school. Over a period of several days the organization would remain the same but the times at which groups undertake the different activities will vary - so that e.g. whilst on the table group A start off the day with reading and writing activities, the next day they may

follow the pattern of group D on the table - each group rotating so that they all experience a similar pattern of activities throughout the week.

This type of organization has developed because teachers have found that it gives them more time and freedom to work with individual children throughout the day. It also means that infant classrooms are very busy and active places where children move about freely getting on with their individual work. Once children at this stage can read reasonably well they are able to work from work cards in maths and science and reading and writing activities although this tends not to occur much at this stage.

2. Junior stage: 7-11 years

There are many similarities between the sort of learning environment developed at the infant stage and that of the junior stage. The main difference is that there are virtually no formal play activities as described at the infant stage; for as children progress through the junior stage the range of curricular activities widens considerably. There is a greater emphasis on writing activities and pupils have far more opportunity to explore their interests and experiences at a greater depth. At this stage also, children are expected to take on far more responsibility for developing their own learning strategies, although, as with the younger children, the teacher is always there to ask questions, guide and advise pupils on the way that their learning develops.

Again importance is attached to the development of first-hand experience as a starting point for learning and the junior classroom will reflect both the interests and concerns of teacher and pupil alike. In the primary classroom there are often animals, plants and other objects brought in for individual children to observe and care for. Many schools also have greenhouses, ponds and gardens which are looked after by the children.

Other ways of providing first-hand experiences are also explored and pupils at this stage have the opportunity to go on school journeys and visits to places of particular significance and interest.

In the junior classroom there are far more work and assignment cards which guide pupils towards different ways of learning and which are also a means of acquiring necessary and relevant information. Again there are reading areas which usually have a wide range of fact and fiction books. Many schools also have a central library/resource centre, containing books, folders, slides, filmstrips and cassettes which are aimed at giving both pupils and teachers the information they need to develop learning. Such resources are essential for the development of autonomous learning behaviour; the great educationalist, Christian Schiller (1979)(1) believed that:

> "Being able to choose depends not only on having the opportunity to choose it depends no less on having the capacity to choose". (p. 70)

In order to develop this "capacity to choose" pupils need to have access to the range of information which will enable them to do this.

It is not unusual for children in a junior class to be involved in a range of different activities at any one time of day, so that one child may be doing maths work whilst another is doing project work, reading activities or art and craft. In many ways the integrated day as it is called is a development of the type of organization which occurs at the infant stage. Sometimes pupils continue

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(1) See Bibliography for further details.

TABLE SHOWING ORGANIZATION OF GROUP ACTIVITIES FOR ONE DAY IN A TYPICAL INFANT CLASSROOM

	9.00	10.15	10.45	11.30	12.00	1.15	2.15	3.15	3.30
Group A	Reading/Writing Activities	ASSEMBLY AND BREAK	Art/Craft	*P.E.	LUNCH	Number Work	Play - Sand/Water Wendy House		Story
Group B	Number Work		Play - Sand/Water Wendy House	*P.E.		Reading/Writing Activities	Art/Craft		Story
Group C	Art/Craft		Reading/Writing Activities	*P.E.		Play - Sand/Water Wendy House	Number Work		Story
Group D	Play - Sand/Water Wendy House		Number Work	*P.E.		Art/Craft	Reading/Writing Activities		Story

* on other days this time may be spent for either music or movement and drama.

Two children enjoying a quiet moment in
the Reading Corner at High Cross JMI School

to work in groups but more often than not these groups will be of their own choosing and will vary according to what activity they are involved in.

In the integrated day pupils are responsible for organizing when they do work in the different curriculum areas. Each child knows what amount of work he or she is expected to complete within a day, or a week, and he or she allocates whatever time within the day, or week, they consider necessary in order to complete it.

It may be thought from this description that there is very little teaching done by the teacher in this type of organization. This is not so far as we have said earlier the role of the teacher has changed to that of adviser and guide; someone who is sensitive to and who responds to the individual learning requirements of each child. Indeed, this type of teaching demands far more of the teacher because they have to assess and evaluate individual attainment rather than considering the performance of the class as a whole. Creating a lively and interesting learning environment which pupils respond to, is part of the teacher's professional skill, as is her knowledge of what type of teaching and learning each child needs. The way that Connie Rosen (1967)(1) defines her role in the classroom gives us great insight into what sort of places classrooms can be given that the teacher's perception of what he or she can do is as rich and wide ranging as Connie Rosen's was:

> "I can only aim at making a triangle of myself, the children and the activities outside both of us, but in which we are both involved for different reasons. We must make and do things, paint and stick and cut and go for walks, collect things, feel things and discuss them together. In some ways there is too much talk that needs pruning and trimming, and too little of the purposeful reasoning talk. The talk I am aiming for is the talk that arises out of shared experiences, experiences enjoyable and interesting to all of us, organized and yet allowing children freedom to express themselves. Talk that will encourage comment and criticism and lead them to think about what is happening to them". (p. 28)

The junior school teacher is also, like her colleague in the infant school very concerned about the development of specific concepts at this stage. By developing the perceptual awareness of pupils, she is able to relate this to the acquisition of a whole range of concepts across the curriculum. Although the curriculum widens, it does not, at this stage, break down into specialist areas on the timetable. Pupils are able, through either group or individual project/topic work, to develop linguistic, mathematic, scientific, historical, geographic and artistic concepts. There is much cross-fertilization between the different disciplines and pupils are able, as a result of this, to think laterally, to consider and try out different ways of enquiry and problem solving.

There is also far more collaborative learning at this stage. Pupils often work in friendship groups and are thus able to develop their thinking much further through group discussion and through sharing and developing knowledge and experiences together. It must however be stressed that the development of attitudes of curiosity, perseverance, co-operation, responsibility and self-reliance does not occur overnight It is an approach to learning which is developed from when the child first starts school. We have shown how, in the infant school, young children are guided towards ways of working which depend upon them being encouraged and expected to be responsible and capable human beings. This is developed much further at the junior stage but this development is only possible because of the foundations which have been laid at the infant level.

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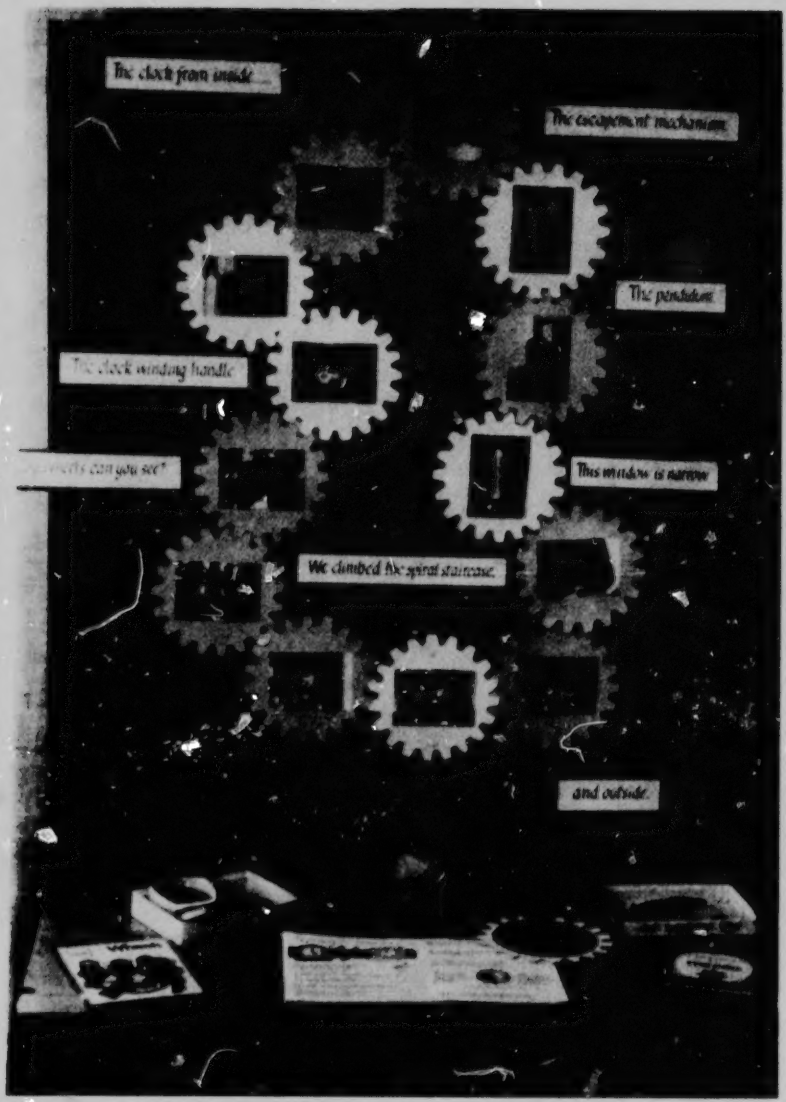
(1) See Bibliography for future details.



A display of clocks and their
mechanisms at High Cross JMI School

3. Secondary stage: 11-16 years

Perhaps the most significant difference that occurs when children transfer from the primary to the secondary stage of schooling in England is the change to a time-tabled day where the curriculum is taught through specialist subjects. It may seem that dividing the school day into eight periods where pupils move from one room to another for different subjects, will operate against the continuing development of autonomous learning behaviour. It would be fair to say that this change does indeed act as a barrier for many children. They often find the change from the small context of the primary classroom where they had a special relationship with one teacher to the much larger context of the secondary school very different to relate to at first.

In the secondary school pupils can have contact with as many as ten or eleven different teachers of different subjects and it is often true to say that on average they will meet at least four or five of them during any one school day.

There are however several organizational changes which have started to occur at the lower end of the secondary school (11-13 years) where attempts have been made to timetable the pupils less and to give them more contact hours with individual teachers. As a result of this they may find that their form teacher teaches them for more than one subject, e.g. English and humanities (geography, history and religious education), and that during a school day they may have contact with no more than two or three teachers. This sort of organizational change eases the transition and reflects the concern, felt by many secondary teachers, that the sort of developmental approach to learning, which has been established in English primary schools, should be continued at the secondary stage.

This concern for the development of many aspects of autonomous learning is reflected across the curriculum. What, however, does operate against it, at the secondary stage, is the time that it takes for pupils to learn in this way. We have already shown (see Appendix I) how one group of children in science retained more but initially appeared to learn less than the two other groups monitored who had learnt in more conventionally acceptable ways. Secondary teachers argue that they do not have time to develop learning entirely through the pupils own interests and experiences because of the amount that pupils are required to learn in different subject areas. This reflects the demands made on the secondary school curriculum by the public examination system which pupils sit at the age of 16. Many teachers compromise and offer their pupils a combination of the traditional approach, where they give what they consider to be essential information, and an enquiry based approach which they hope will relate to the pupils' own interests and experience.

Within the secondary school far more responsibility for the development of specific learning environments occurs within subject departments. The head of department is often responsible for the sort of policy towards teaching and learning which is developed by his or her teachers.

It would be fair to say, that whilst secondary schools do not generally create learning environments which are conducive to the development of autonomous learning behaviour, there are nevertheless many notable exceptions within particular subject departments in different schools. We believe that this occurs in the case studies we describe in Part IV of this paper.

Three of these case studies show how imaginative teachers are able to use the framework offered by the public examination system as a framework for the development of autonomous learning. We feel that it is significant that Public

Examination Boards have recognized this need in the way that syllabi are being re-structured often with the direct involvement of teachers in individual schools, and, as we have shown in two of our case studies, also with the involvement of the pupils themselves.

IV. EXAMPLES OF AUTONOMOUS LEARNING

1. The development of autonomous learning in French: 7-11 years.
2. The development of autonomous learning in scientific activities: 9-11 years.
3. The development of autonomous learning in English: 11-13 years.
4. The development of autonomous learning in drama: 11-16 years.
5. The development of autonomous learning in English: 14-16 years.
6. The development of autonomous learning in technology: 14-16 years.
7. The development of autonomous learning in design: 14-16 years.

Wheatfields, J.M. school, pupils 7-11 years

The development of autonomous learning in French: 9-11 years

During the late 1960s early 1970s many primary schools and all middle schools began to teach the French language to their pupils. It was decided that children would start learning French at 8 years or 9 years old, allowing for a minimum of two years at the J.M. or J.M.I. school before transfer to secondary schools. In the case of middle schools, four years would be covered before transfer to the upper school. An oral approach was used, with the children hearing French only for the first year; the written word was introduced later.

Wheatfields in common with many other schools did not wish French to become a specialist subject taught by a teacher who came to the school for that purpose only. They favoured the solution of having French introduced by the class teacher, or another teacher within the school, so that it could be properly integrated into the curriculum. At Wheatfields J.M. School the headmaster takes a particular interest in the teaching of French. He takes some classes but there are also three other teachers in the school of 290 pupils who are involved in the French teaching programmes. In all there are seven classes learning French. The children start at 8 years of age.

It was found that many primary teachers needed special help to improve their own standard of proficiency in the spoken word, before they could teach French. They also needed course material which would provide support where they felt uncertain of their capabilities. In-service proficiency and methodology classes were set up to help teachers become familiar with the French language and course materials.

The course materials, provided for primary schools, initially contained a considerable amount of work on tape. Whilst these brought a variety of "real" French voices into the classroom, children rapidly became bored with the constant

listen and repeat techniques. The teachers felt that the rigid structure of the material was totally different and in opposition in its conception to the child centred work being carried on in other areas of the curriculum. There was also the problem of having large mixed ability classes and the early course materials made little provision for the different rates of learning of the individual child. There was a disenchantment with primary French for these reasons, although other factors also contributed, and as a result of this many primary teachers in the late 1970s abandoned French.

Some teachers, however, felt that French had a great deal to offer the young learner of eight or nine years and they strove to find ways of making this activity more flexible and more easily absorbed into the philosophy of the primary school. In consequence a variety of activities which make provision for children of different levels of ability to progress at their own rate have been created by groups of teachers. They are based on the course material being used, or the theme being exploited, e.g. Paris, a region of France, homes, customs, etc.

It was noted that children would learn more quickly if they could touch or handle a picture when being asked to recall a word of vocabulary; that any learning activity in French presented as a game would be more successful, especially in the early months before the children had been shown the written word and had to rely entirely on aural recall. For these reasons what is now termed games material(1) came into being.

It was intended initially to provide practice of commonly used structures or vocabulary. Although termed a game, frequently there is no winner.(2) In the case of "Est-ce que je peux"(3) and other similar games the winner is not the player who is the most proficient at French. This is intentional so that weaker children are able to take part on equal terms.

All the games for children in the first year of French have pictures of symbols but later words and simple sentences are included. In the first instance the games were made by teachers. They were for small groups of pupils, usually a maximum of six, but often involving only two children.(2) However, the children rapidly started to make their own initially, by copying those made by the teacher and adapting the way the game was played, but later by inventing their own games. Naturally, the teacher had to check that the French to be used in playing the game was correct. Great interest was shown by the children in the idea of gender, mistakes were self-correcting by the colour coding of all nouns on games - a blue spot for masculine, a red spot for feminine. It is now possible to see a group of children in a classroom playing a board game in French, of their own making, while at the same time other group activities such as maths or English are also taking place. These games are also very popular during a wet playtime when the children stay in.

Most of the course material used in primary schools introduces the children to "situations". The children hear short dialogues on tape, they learn these and are later asked to use them in a more personal way by changing names and introducing other items learned previously. As children are encouraged to invent their own plays as part of their English activities under the heading "drama", they will undertake to do this in French often with great success. Frequently, children

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(1) See Appendix III a, b, c and d.
(2) See Appendix III c.
(3) See Appendix III b.

learning French will say "We have made a French play, can we act it?". The play is not original but, in this way, children are beginning to manipulate language by acting out little scenes of their own creation in a meaningful way. An example of this is included in Appendix III (e). The children, aged eight years, who wrote this had been learning French for less than three months. They had not seen the French word in written form hence the attempt at phonetic spelling. Children are encouraged to act out dialogues without any type of written support, but in this case the children felt the need for the dialogue to be scripted although the sheet was not used during the action.

Other activities are undertaken by children through the medium of the French language. Simple puppets that speak only French, French model houses are constructed with French furniture. All these activities are undertaken in the primary classroom by groups of interested children alongside other activities taking place in the English language. Weaker children integrated into groups playing a board game or becoming involved in activities with a French purpose learn a great deal from their peers without any intervention by the teacher.

When the pupils are in their second year of French it is not uncommon for them to use a listening set[1] and this might be one of their tasks for the day or the week when the school works an integrated day.[2] A variety of material can be introduced by the listening set but one of the most useful is to give children the opportunity of listening to a French story-book recorded on the tape. They would have the book open in front of them and in this way absorb the pronunciation of the written word while gaining the gist of the story.

In all these ways children are undertaking the responsibility for their own learning of French. Although class lessons are still necessary a lot of the work can be carried on autonomously by children being engaged in individual or group activities. However, the teaching of a language cannot be entirely child centred, the teacher must exercise vigilance to see that errors are not being absorbed.

It is interesting to see that autonomous learning can occur in an area of the curriculum, in which traditionally the teacher has played the greatest role as a conveyor of knowledge. The breakthrough in primary schools such as Wheatfields where group work and individual activities in French are encouraged can also sometimes be found in the lower classes of secondary schools. There is no doubt that if children are sometimes given the freedom to learn French in this way, they will not only find it more enjoyable but also retain much more.

High Cross, J.M.I. school, pupils 5-11 years

The development of autonomous learning in scientific activities: 9-11 years

Puller Memorial School is a small village school with 67 pupils on roll at the present time. Pupils are grouped in three classes; the first class has 5-7 year olds, the middle class has 7-9 year olds and the top class has 9-11 year olds.

(1) A listening set consists of a junction box which is linked to a tape recorder, cassette or reel to reel. The junction box has 6-8 headsets. The pupils listen to the material recorded on the tape through the headsets so that other children in the classroom engaged in other activities are not disturbed. Children engaged in this activity need to be at the same level of proficiency as the tape cannot be controlled by each individual child.

(2) See Part III for further details.

Because of the size of the school, the headteacher teaches one of the classes herself: the middle class of 7-9 year olds. Although she has only been at the school since April 1979, the headteacher is keen to develop autonomous learning behaviour throughout the school, from the age of five onwards. She believes this can only be done by creating a framework within which children are able to develop a wide range of learning experiences through observation and enquiry related to knowledge they have acquired both in and out of school.

All three classes work an integrated day,(1) although the older children had previously been taught more formally. The changeover to an integrated day has occurred since the arrival of the new headteacher. The top class of 9-11 year olds have found the process of change more difficult than the younger children. This is partly because they are more fixed in their attitudes towards, and in their expectations of, school. It is also because they see the younger children assuming various rights and privilages which previously had only been available to top class children. Many of them feel that their position within the hierarchical structure of the school is now being threatened. Because of this change, these pupils are still in the early stages of developing autonomous learning either individually or in group work.

The 9-11 year olds are at this stage very limited in their ability to follow through a particular line of observation and enquiry; although they are encouraged, by their class teacher, to develop this type of learning. The opportunity to develop autonomous learning requires time; time to allow pupils to try out ideas, to observe, to play, to manipulate. This often happens when pupils are working together in music, drama, art and project work. Because these pupils are now organizing their own day, in terms of the amount of time they spend on different activities, they are beginning to work together in small groups, following up their own starting points for learning.

A good example of this occurred towards the end of the autumn term (1979) when one of the boys in the top class brought in some old light switches and batteries from home. He and two of his friends decided to try to make the switches work and were given a battery by the teacher to enable them to do this. They played around with wires, batteries and switches for some time before they constructed a simple circuit board using foil and wire laid out on a piece of wood. They then started to build problems into the circuit by constructing an alarm system via trip wires which, when activated, lit a bulb at the end of the circuit. When they had completed this they decided to construct a more complicated buzzer circuit which was built in the form of a game where the player had to manipulate a wire loop around a twisted piece of wire set up on the board and linked to an alarm bell. If the loop touched the wire the bell rang.

The boys went on to develop this work early in the spring term (1980). After a while their interest waned and one of the boys decided to try to connect two old telephones which had been brought into the school for children in the first class to play with. By using cable which he had got from home, he was able to connect the two phones and it was possible to use them as a means of communication. Unfortunately the cable was quite short so the distance the children could communicate with each other was realtively small. However he was planning to build an intercom system between the first and middle classrooms when he could get an adequate amount of cable.

The next stage in using wires, batteries and switches occurred when the same group of boys decided to make a burglar alarm and incorporate it in a model they had

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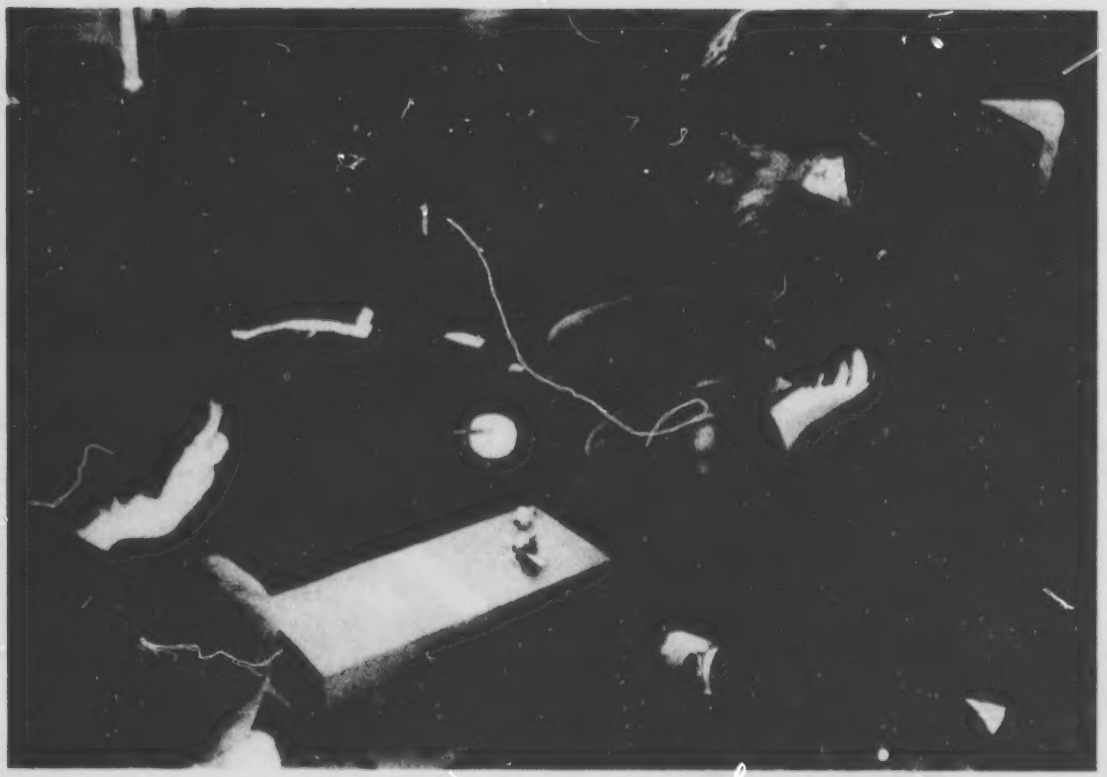
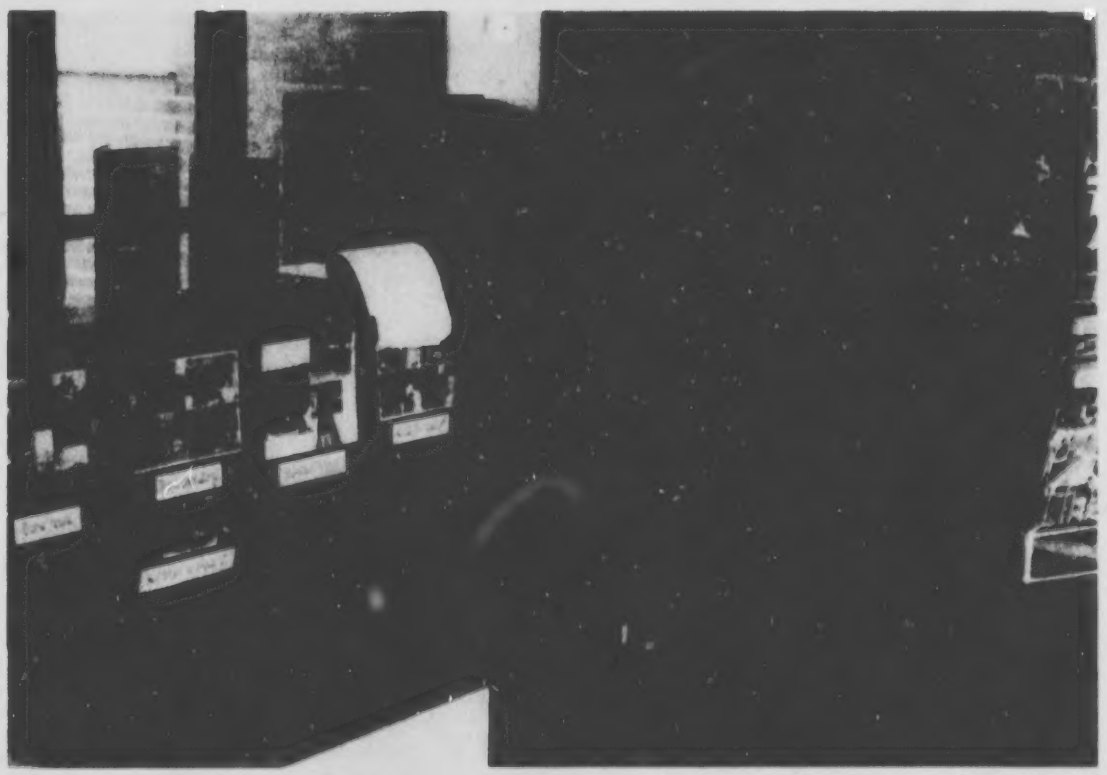
(1) See Part III, section 2.



Pupils at High Cross JMI School trying out their burglar alarm



Part of the entrance to High Cross JMI School

made. They wired up the underside of the model in such a way that any pressure exerted on the model caused the buzzer to come on. In this instance they were applying knowledge they had acquired previously through what may appear to have been a play situation. They had also started to record, in a very unsystematic way, their findings. This involved them writing down what had happened and drawing diagrams of the different stages they went through when making the completed system.

It was possible for this group of boys to work together from their own initiatives, in the way described, because they could organize the time for doing this work themselves. They were able to do this because both their classteacher and the headteacher believe that children need to have time to play; time to experiment; time to hypothesize if they are to take on the responsibility for developing their own learning strategies; which is what the development of autonomous learning behaviour implies.

Ralp Sadleir middle school, pupils 9-13 years

The development of autonomous learning in English: 11-13 years

This case study shows how pupils of 11-13 years are guided towards developing autonomous learning within the framework of their English lesson. Their teacher is particularly concerned with developing ways in which pupils can examine the different aims and purposes involved in "writing for others". This term implies writing for a variety of audiences. The teacher is concerned that the children she works with should perceive the process of writing as both a purposeful and enjoyable activity, and has, since 1975, developed a variety of approaches which enable pupils to "write for others". The writing has developed in three ways:

1. writing for other schools;
2. writing for an author;
3. writing for other children in the same school.

1. Writing for other schools

The aim of this particular project was for fourth-year pupils (12-13 years) from Ralph Sadleir, to write stories for children in one of the "feeder" first schools.

Initially the Ralph Sadleir pupils prepared a question sheet for a taped interview with the first school children. At this stage they received guidance from the teacher on determining their aims precisely and on structuring their questions. The questions were deliberately designed to be open-ended and were aimed at encouraging the younger children to talk about their interests. Groups of Ralph Sadleir pupils then went into the first school to question the younger children about their interests and recorded their interviews on cassette tape. The Ralph Sadleir pupils listened to the tapes and used them as a starting point for the stories they then went on to write. There was a twofold purpose in recording the younger children; first, to find out their interests, and second, to listen to their language, so that, where possible, the written stories should match in terms of vocabulary and expression.

This work was originally started in 1975-1976 and proved highly successful - so much so that although the original pupils from Ralph Sadleir moved on to the local upper school (13-18 years), the practice has since continued and has become a feature of the work produced in English.

The next section shows how the Eastern Arts Association's Writers in Schools scheme[1] provided a starting point for writing for another audience.

2. Writing for an author

Ralph Sadleir school has been using the "Writers in Schools" scheme for several years. The teacher in charge of English believes that pupils benefit from the scheme in a variety of ways:

(i) They are able to see that writers are "real" people.

(ii) They are able to gain some insights into what the writing process involves.

(iii) They are able to question the writer about the process.

(iv) They are able to see how a professional writer develops plot, character and narrative from what might appear to be uneventful, everyday happenings.

(v) They are able to see how much work is involved in producing a completed story - writers involved in the scheme often bring along different draft versions of a chapter of one of their books so that pupils can appreciate the amount of self-discipline and hard work involved in producing a book.

The section shows how two groups of third and fourth year pupils responded to a writer visiting their school in the spring and summer terms of 1979. Jan Mark, author of Thunder and Lightnings which won the Carnegie Medal for children's fiction in 1976, first visited Ralph Sadleir school in March 1979. Whilst at the school she talked to two groups of children, 11-12 year olds and 12-13 years olds. She described how she created stories from everyday events and situations which she had observed and re-collected from her childhood. She also read extracts from some of her books and described how she developed the characters through dialogue and through the settings that she, the author, put them in. Both groups were interested in what she had to say and were very responsive, asking lots of questions towards the end of the two sessions.

After Jan Mark's visit the pupils in both groups asked if they could write to her to express their enjoyment and appreciation. All their letters were sent by the English teacher, together with a covering letter expressing the hope that Jan would be able to visit the school again in the near future. In response to the letters, Jan sent an un-published short story that she had just written to the school. She also sent a covering letter explaining who the story had been written for and telling the children when, under what title, and by whom the story would eventually be published. Both groups were very thrilled and excited to receive a story in manuscript form, from a "real" author; so much so that they conceived the idea of writing their own stories for Jan Mark. This was a completely spontaneous reaction on their part, and the process of writing the stories took about three to four weeks during the first half of the summer term.

The stories from each group were sent by the English teacher to Jan Mark as they were completed; about forty were sent altogether. Jan arranged to visit the school again in June to talk to both groups of children about their stories. Before doing this she read through each one individually, and made detailed notes so that she could refer to and discuss each one with their authors when she next visited the school. When she talked to the two groups about their stories she was constructively critical, praising some parts and discussing with individual children how they could amend and improve other parts.

(1) The writers in schools scheme is subsidized by the Arts Council of Great Britain on a national level and also by local authorities on a regional basis. The Eastern Arts Association serves Bedfordshire, Cambridgeshire, Essex, Hertfordshire, Norfolk and Suffolk. Through the scheme writers are able to go into schools in the area and are able to talk to and work with pupils. Each school is entitled to three half day visits a year; Eastern Arts pay the writers' fees, whilst the school pays travelling and other expenses.

The effect of this sort of dialogue on the work of these children has proved to be extremely beneficial. They are now far more concerned about the process of writing as a means of expressing what they want to say, rather than writing "to please teacher". They see themselves as writers, and, as such, are concerned with ways of improving their writing, because they see it as having a specific purpose which either they have determined or which they agree to.

3. Writing for other children in the same school

The most recent example, at Ralph Sadleir school, of pupils writing for another audience, occurred towards the end of the autumn term (1979). The starting point for this work was the children's interest in a new book in the school "Fungus the Bogeyman" by Raymond Williams. The book is presented in a comic-strip style and is a parody of the conventional comic strips. Its presentation and content appealed enormously to many of the children. Parts of it were read to the third and fourth year pupils by their English teacher, who suggested that they might like to write their own stories, using a similar format; either for younger children in the school, or for other children of their own age. All the pupils concerned were extremely enthusiastic and became so involved in this work, that all their other English work was suspended for the last three weeks of term.

Pupils worked together in friendship groups of two or three on the stories, and were involved in a great deal of consultation and planning in the initial stages. In some instances one person in the group would be concerned with all the illustrations, whilst the other would be concerned with the writing. Story line and layout were nearly always planned together. The quality of presentation and layout of all the books was very impressive. It was obvious that all the pupils involved had spent a great deal of time, both in and out of school, on these projects.

Two of the third year boys had produced an extremely complex and detailed parody of J.R. Tolkein's "The Hobbit" which they had called "The Blobbit". They had gone to great lengths to establish both context and characters for the reader. There were detailed illustrated studies of all the characters in "The Blobbit" and the story line was interspersed with information sheets, e.g. there was one called "The Blobbit Universe" which gave the reader very detailed background information on both the environment and habits of the Blobbits. Although their basic idea had come from Tolkein they also used ideas from cartoonists in national newspapers to illustrate their story and had even gone to the lengths of making up a special Blobbit language. It was obvious, when talking to the two boys, that this work had involved them totally. Their enthusiasm and the way that they had thought through their work was impressive. Perhaps even more impressive was their self-criticism; they were highly critical of parts of the original draft of their work and were spending a great deal of time modifying, amending and adding to the original.

They had also received a great deal of support from their parents. The father of one of the boys had gone to the lengths of getting the work photocopied in colour and had had three bound copies made at a cost of £10 per copy, one for each of the boys concerned, and one for the school.

Although the two boys had obviously discussed the way they should present their story and had made decisions about the allocation of work, it was obvious that one of the boys (the one whose father had photocopied and bound the book) was almost entirely responsible for the detailed development of the work. He was full of ideas for a possible sequel which he would call "Sword of the Things", his only complaint being that they had not had enough time at school to spend on this work. The boy was so involved and interested in writing stories that he brought in a story called "Catacombs of the Undead" which he had written at home, of his own volition, for the teacher to read.

A selection of books written by pupils at Ralph Sadleir Middle School

Two third year boys checking through their work

It would be fair to say that the way that this particular venture had taken off with these two boys was exceptional. However, there were two other boys, from the fourth year group, who, although they hadn't had the opportunity to have a bound version produced, had still spent a great deal of time and thought upon their work. When talking to the fourth year boys, it was apparent that the work-load was far more evenly divided. They had, for purposes of continuity and presentation, decided that one should write up the story, whilst the other did all the illustrations. They too, were very self-critical, and were looking forward to having another opportunity to produce a story which they were convinced would be better, because they would learn from mistakes they had made in the previous work.

All the pupils involved said that they had enjoyed writing the stories and had appreciated the scope given for them to use their imaginations. They were all looking forward to the opportunity of writing more books of this kind in the future. Some of them had read their stories to the first years (9-10 year olds) and had passed their stories round the class so that they could all read each others. It was interesting to note that, although the pupils had ostensibly set out either to write stories for younger children, or their peer group, they were far more interested in the process being an enjoyable and satisfying experience for themselves at this stage.

By describing in detail the writing for different audiences which has developed at Ralph Sadleir school during the last five years, we have been concentrating on one particular aspect of English work in that school. It would, however, be fair to say that it is only a part of that work, which also includes a great deal of group oral work in both reading and writing. Pupils are encouraged to express and record their ideas and findings in a variety of ways and extensive use is made of the cassette tape recorder for both group and individual work. The English teacher places a high value on the part that language plays in learning and tries to create a learning environment which enables pupils to explore a variety of possibilities and experiences, as has already been illustrated in the description of writing for others.

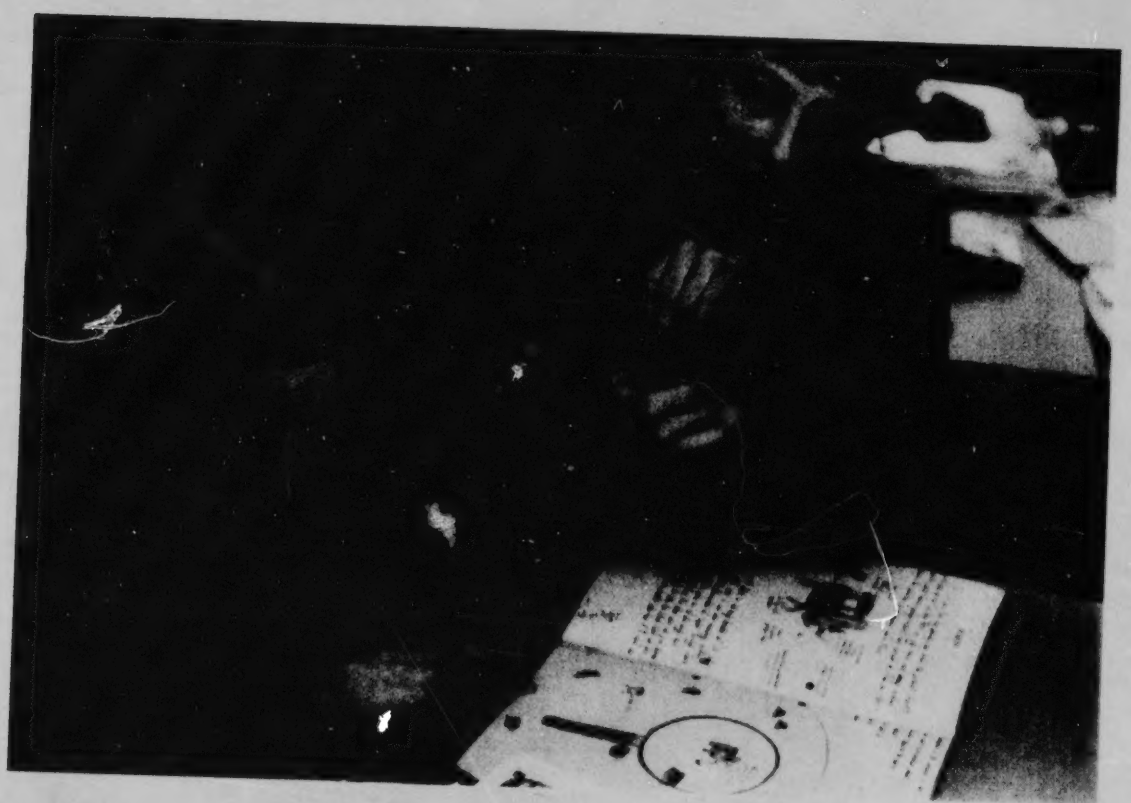
Pupils are actively encouraged to read a wide range of books, and a variety of methods of sharing experiences are employed. These include written and recorded book reviews; group discussion about a particular book; individual and group discussion about poetry. It could be said that in their English lessons pupils are being encouraged to develop not only their means of expression, but also the way that they think and how they relate their thought to experience. The teacher is thus actively encouraging the development of autonomous learning behaviour by creating a framework within which pupils are able to make decisions about their own learning.

Turnford, comprehensive school, pupils 11-18 years

The development of autonomous learning through drama: 11-16 years

In 1979 a teacher of English at Turnford school decided to tackle the preparation of the annual school play in a different way. He had for some time been dissatisfied with the traditional approach of choosing a play, holding auditions for the different parts and finally rehearsing the selected group so that a polished performance could be presented to parents. In this case the final performance is the creation of the producer the players being merely puppets with only limited scope for personal expression within a well defined structure.

Two third year girls looking at their book



Two fourth year boys explaining how they wrote their story

It was therefore decided to call together any pupils who were interested in taking part in a play, without holding auditions. Meetings and rehearsals were to take place after school and at week-ends. Forty-five pupils were involved, the majority from the first four years, children aged 11-14 years, with some as old as 16 years. Only six of the pupils had taken part in a public performance on a previous occasion.

At the first meeting, the teacher suggested two themes to the group and proposed that plays might be developed from one of them. The first suggestion was the story of Saint Nicholas, the second was based on a Victorian-style boarding school where the pupils used a machine to produce sticks of chalk. The machine also had other magical uses. Partly due to the number of pupils who wished to be involved in the play it was decided to adopt both suggestions and the forty-five pupils divided into two groups each adopting one of the themes. It is interesting to note that a few children took part in both plays as they were considered by the other members of the group to have the right qualities required.

Considerable discussion took place on the themes and this helped the pupils to clarify their ideas. It was not until three meetings had taken place, about six hours of discussion, that a plot began to emerge and with it the characters to perform the action. Smaller groups of four to six pupils now worked together on different parts of the play. Ideas gleaned from past experience, books, television plays, were incorporated. Scenes acted out, gesture and dialogue slowly came into being but not without difficulty. There were relationships between the players to be built up, problems to be solved. Pupils found they had to learn to respect what others wished to contribute, to negotiate, and that to be vociferous is not always the best way. Gradually the groups became very well knit and members were supportive of each other despite previous difficulties. As their self-confidence developed their performance in acting out the scenes improved. During all this time the teacher only intervened to assist with problems with the groups which otherwise worked quite autonomously. He was called upon for advice on some occasions but mostly did not see the scene until the group had decided on the characters, dialogue, gestures. The scene was then put into written form and after more discussion was knit together to make a whole with other scenes which had been produced by other groups.

It could be said that the creative work which takes place during the production of a play of this nature is of greater importance than the actual performance. Certainly pupils working in this way learn to relate to each other, to talk to each other about a common interest, to express themselves without intervention from the adult. However the intention of this group at the outset was to produce a performance and it was essential for the pupils to also have the satisfaction of relating to an audience. As the work reached its conclusion other duties involving the lighting, the set, were taken on by groups of pupils. Parents attended the performance on the date which had been fixed and although it was felt by the teacher that the presentation lacked the polish of a traditional performance, the pupils taking part had gained much more than on previous occasions. As with all autonomous learning situations, the time taken is of necessity much greater than when the learner is fed with material. There is always trial, error, a fresh start, but the process of autonomous learning although much slower gives the learner much more than knowledge which is often easily learned and quickly forgotten.

The development of autonomous learning through English: 14-16 years

Although it is much regretted in secondary schools that the pressure of the examination system frequently leaves little time for autonomous learning, nevertheless tremendous strides have been made in recent years towards more pupil involvement in what they learn in many subjects on the curriculum. English, which is a compulsory subject for all pupils until they leave school, now comes into this category.

For pupils with the ability to take O level[1] in English, the A.E.B.[2] syllabus III allows pupils the freedom to suggest the literary works they wish to read. The two year course starting in the fourth year gives pupils the time to read[1] eight novels, six short novels, an anthology of ten poets and to choose those which they wish to study in greater detail in the fifth year.

The course work represents 40 per cent of the marks for the English examination and much of this is done by assessment. During the fifth year pupils write eight essays from a list of suggested essay subjects on the books they have chosen, these are marked by the school but moderated by the Examining Board. Pupils also study three texts: a play, a novel and other writing which are set and examined by the Board.

Pupils participate in drawing up the list of course work by proposing books for inclusion. This has led to considerable discussion between pupils who read more widely and with greater interest as they need to be prepared to argue for the books they wish to see retained on the final list. It would be fair to claim in this case that by allowing pupils more autonomy in what they study their motivation is greatly increased.

Simon Balle, comprehensive school, pupils 11-18 years

The development of autonomous learning in technology: 14-16 years

Pupils at this school can opt to do either a C.S.E. or O level course[3] in technology (Cambridge Board) at the end of the third year (14 years). The course involves developing basic techniques related to technology in the fourth year and the development of an individual project in the fifth year. Pupils following O level and C.S.E. courses are grouped accordingly in the fourth year; however in the fifth year they all work alongside each other. The fourth year is divided into three modules, (one per term), these are: electronics, pneumatics and mechanisms. Other necessary techniques, such as structures, materials and electro-magnetics, will already have been introduced in other subjects, and will therefore be easier for pupils to relate to than the modules, which introduce new and previously untaught information.

The teacher responsible for the course believes that the examination requirements encourage pupils to develop particular ways of thinking related to methods of

(1) O level: see Education in England, Examinations.
(2) A.E.B.: Associated Examining Board.
(3) See Part II for further details.

solving problems. High emphasis is placed on the individual's ability to examine alternative possibilities and on ways of questioning why and how an object works. The course enables pupils to proceed at their own individual rate. It also, in the fifth year, gives pupils the opportunity to initiate their own project and to direct the way in which it develops throughout the year.

This means that pupils who are often considered to be non-academic are able, because of the emphasis on individual response, to develop self respect in relation to their own capabilities. They are also, because of the practical nature of the course, able to see its application to the outside world. It provides an excellent bridge between what Dougles Barnes (1976)(1) describes as "school knowledge" and "action knowledge". It is possible, within the context of this course, for all pupils to succeed in some measure. For unlike many other examination subjects which tend to rely on memory, the way in which this particular course is examined operates in favour of those pupils who work consistently, methodically and systematically. Often those who produce the best results are not necessarily the most academically able.

The examination is divided into three parts: the individual project; pupils' folder work; and a three hour paper. Towards the end of the summer term all fourth year pupils have to decide what they will do for their individual projects in the fifth year. They discuss possibilities with their teacher, both individually and in groups and are expected to think through their projects before they start. This is because their teacher believes that each individual project should not only be thought out carefully beforehand but should also have a definite objective at the end, which the pupils have worked out before they start. Although changes of direction may occur in the process of actually realizing the project, the teacher maintains that pupils should always start from a firm objective.

The way that pupils develop their projects is reflected in their folders and a great deal of importance is attached to the way in which pupils record and present their findings. They are, throughout the course, encouraged to develop a systematic way of writing up and recording what they have done. Once pupils have decided on their project they write out a specification which outlines the way they expect it to develop. They also at this stage collect together as much information as they can on their proposed project; from the school library, the local library and by writing to manufacturers in the same field. Many pupils also enlist help from parents, friends and other members of staff. The variety of projects undertaken is impressive, this year they range from burglar alarms to a digital multimeter which is being made by one boy for his own use. There is a high level of interest and involvement in the project work and pupils are not only expected to make their projects but they are also expected to carry out feasibility surveys afterwards. One fifth year boy was looking into different designs for the hull of a motor boat. He was doing all the practical work for his project at home and had already made two fibre glass hulls by cutting polystyrene and making a plaster mould for each. When the hulls were completed he tried out each one, powered by a 3 volt battery, over a distance of 100 metres in the school swimming pool. He discovered that the angular shape of the hulls made from polystyrene moulds slowed down the potential speed of the boat. He then decided to make a mould out of another material, clay, so that he could produce a curved shaped hull, which, he predicted, would go faster than the first two made from the polystyrene moulds. This boy was using knowledge he had acquired in another curriculum area and was able to apply it in the process of developing and realizing his project.

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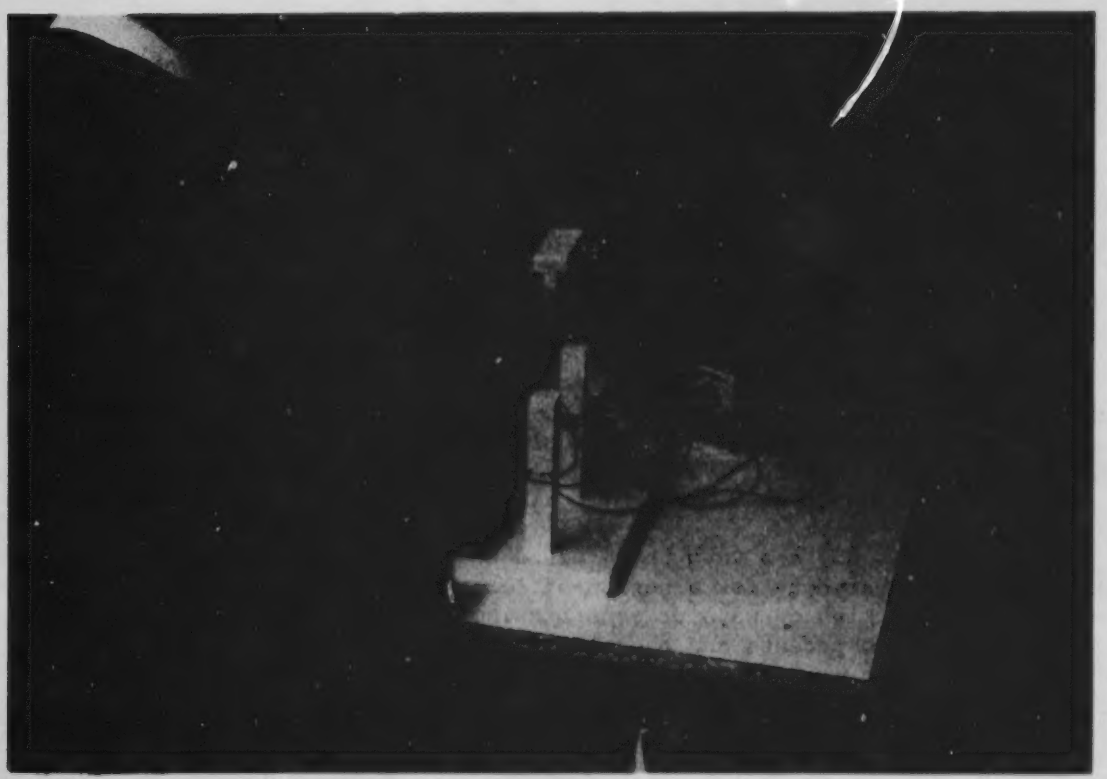
(1) See Bibliography and Part V for further details.

Two fifth year boys using a pressure gauge at Simon Balle School

A fifth year pupil at Simon Balle School testing his burglar alarm



Each pupil is timetabled for two and a half hours technology a week, although the majority spend a great deal of their spare time both in and out of school on the projects. Many pupils work on them during the lunch hour and after school because they need to use facilities which are on the premises. They also, as their projects near completion date, come into school with their teacher at week-ends in order to use the facilities and complete the projects to their satisfaction. In this part of the course pupils are able to set their own standards which are often very high. This is because they are throughout the course developing their own individual learning strategies related to the projects which they have chosen to do. Although the development of autonomous learning behaviour within the constraints of a public examination may seem to be a contradiction in terms, we believe that in this instance the examination structure provides a framework within which autonomous learning behaviour can and does develop.

Sheredes, comprehensive school, pupils 11-18 years

The development of autonomous learning in design: 14-16 years

At this school all pupils follow a common core curriculum and work in mixed ability groups until the end of the fifth year (16 years). Design is one of the six subjects in this core curriculum. As a result of this there are 180 fourth year pupils currently taking a two year C.S.E. course(1) in creative design.

The overall aim of the course is to develop creative thinking. This is developed in the fourth year by setting pupils tightly structured briefs and problems which encourage them to examine alternative possibilities and to select what they consider to be the most appropriate, for a variety of reasons, within the terms of the briefing. In the fifth year pupils decide on a particular project which they develop throughout that year.

In the fourth year pupils work through three modules (one per term). These are:

1. Communication.
2. Human aids and extensions.
3. Living and working space.

The order in which they go through these modules will vary according to which group they are in (see table). Pupils are divided into three groups, so that during any one term, no more than 60 from one year are involved in a particular module. There are 9 members of staff involved in running this course, so that each module is staffed by 3 teachers. The way in which the teaching is organized varies according to the needs of particular groups and the strengths and interests of individual teachers. Sometimes the three teachers teaching a module will team teach, all three working together with the group of 60, and on other occasions individual teachers will work on a particular aspect of the module with a smaller group of 20 pupils. Pupils have two and a half hours a week of contact time with the teachers but a great deal of work is also done at home.

Each module is divided into three parts so that during a term pupils will work on these different aspects for a period of four weeks. The pupils observed in this case study were working on ways of constructing a habitat or living space for a family of three (two parents and one child) for a country with a warm climate

(1) See Part II for further details.

TABLE SHOWING MODULES IN FOURTH YEAR CREATIVE DESIGN COURSE

	Group 1	Group 2	Group 3
Term 1	Communication	Living and Working Space	Human Aids and Extensions
Term 2	Human Aids and Extensions	Communication	Living and Working Space
Term 3	Living and Working Space	Human Aids and Extensions	Communication

where light materials such as pressed cardboard could be used. There were twenty-two pupils in the group working with one teacher on this project which was part of the living and working space module.

The starting point of the project observed was a discussion introduced by slides and photographs. Pupils were then given a design brief which included specific information they would need on the technical aspects of the project. The aim of this particular project was twofold:

(i) To encourage pupils to develop an awareness of the use of space in their home environment.

(ii) To develop creative thinking from the construction of a geodesic model.

This particular work always involves the making of models and is done mainly at home so that pupils have time to develop their individual response to the brief.

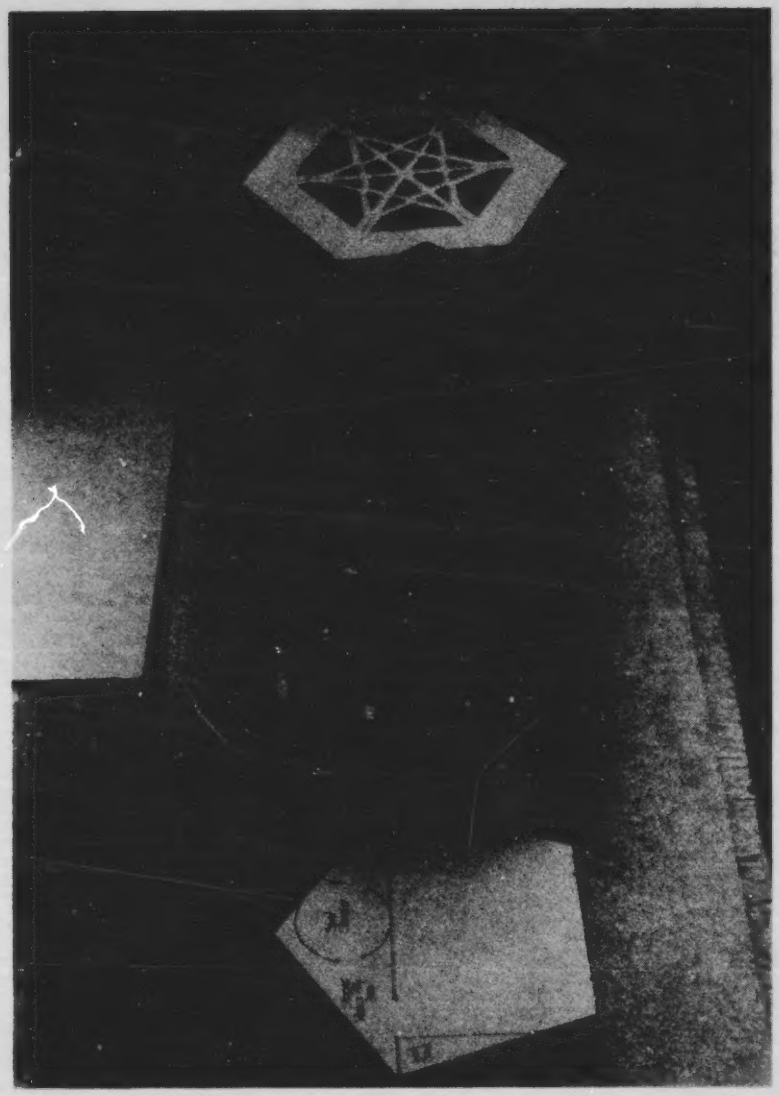
In working through a brief and constructing a model pupils are faced with a number of problems which have to be solved. These vary, according to the way in which the brief is being tackled by the pupil. The role of the teacher during the contact hours is to offer guidance through advice when it is sought without solving the problem for the individual. This is not always an easy role to play but in order to stimulate autonomous learning pupils are encouraged to pursue an independent line of thought even when the outcome might prove unsatisfactory and require a fresh start. In this way the individual pupil learns and retains far more than if the teacher gave a direct lesson requiring pupils to assimilate specific points of importance which could then be applied to a given situation. It also allows for pupils to develop at their own rate and for some to achieve on a very high plane while others show only a minimum understanding of the brief.

In the design brief given to the group observed (see appendix IIa) pupils were not only asked to construct a habitat or living space for a family of three (two parents and one child) for a country with a warm climate where light materials such as pressed cardboard could be used but they were also required to look into the possibility of incorporating the geodetic dome, cube and prism constructions. A sheet (see Appendix II (b)) showing "nets" to assist the pupils is also provided by the teacher and each pupil can ask as many questions individually as he/she desires. There is no element of competition between the pupils as each pursues his/her own line of enquiry.

The results of this project which are assessed by the teachers at the end of the given time count towards the C.S.E. examination. It was interesting to see how individual pupils had handled the brief. Some had produced well thought out schemes and paid great attention to detail, whist others had introduced complicated shapes showing great imagination, whereas one or two of limited capacity and no vision had used only a shoe box as a basic shape. The value of this type of individualized work is however that no pupil is held back by his peers or is led to a feeling of failure because he is being compared to others. This is essential when dealing with pupils of all abilities in the same group.

V. CONCLUSION

In Part III of this study we have looked at the way in which learning environments were set up within English schools in order to develop the acquisition of autonomous learning. We feel that the sort of learning environments described can only be created where both headteachers and their staff have the



Example of a model incorporating the geodetic dome

Examples of models made by fourth year pupils at Sheredes School

freedom to organize the ways in which they do this. There are tremendous variations between schools in England and this is due to the way that they are organized, both by the local authority and within the school itself. In this way each school develops its own ethos.

In Hertfordshire children at the primary stage usually attend the nearest school to their home, but when they reach the age of eleven, they are able, with the help of their parents, to choose their secondary school. This freedom of choice usually makes both pupils and parents loyal and supportive members of the school community.

Heads of schools have considerable autonomy to plan and organize the curriculum for their pupils and do this in consultation with members of staff. This organization and planning is also influenced by current learning theories and educational philosophies; hence the introduction of the integrated day into some, but not all, primary schools; of mixed ability teaching into secondary school, for some or all subjects, for various periods of time. It is this sort of flexibility which has made it possible for some schools to develop programmes of work which allow pupils a considerable degree of autonomy and which aid the acquisition and development of autonomous learning behaviour.

Although in Part IV of this study we have shown examples of autonomous learning behaviour developing within schools, we have, nevertheless, to state that these tend to be exceptional cases rather than the general rule, for often pupils in schools see knowledge as something which is related to school and which has little to do with the world outside. Douglas Barnes (1976)(1) describes this difference as the difference between "school knowledge" and "action knowledge". Barnes defines school knowledge as the knowledge that children acquire in the classroom and action knowledge as the knowledge that children acquire from the world outside school. He sees school knowledge as becoming action knowledge when children have both assimilated and accommodated it, to use Piaget's terms, and thus incorporated it into their own world view:

> "Children need time to assimilate what they are learning by talking and writing about it IN RELATION TO WHAT THEY KNOW ALREADY. Too many classroom discussions and writing assignments ask children to relate strange information only to other strange information: the conversation is carried out in terms of what the teacher knows, while the child's other experience - in and out of school is excluded. This prevents the children from engaging in significant recording of their experience". (p. 85)

It is the "significant recording of their experience" which provides young children with a basis for the continuing acquisition of autonomous learning behaviour. We have shown in Part III of this study how much thought and planning goes into the development of learning environments at the primary stage of schooling. We have also described the changing role of the teacher in relation to those learning environments. The reasons for this change are because of the development of child-centred individualized approaches to learning. As we have said earlier, this sort of approach looks at learning as a developmental process and as a result of this individual notions of success and failure are relative.

The introduction and development of mixed ability teaching in virtually all primary schools and many secondary schools has led teachers to think more carefully about what, and why, they are teaching. The emphasis on the needs of the individual has meant that they are concerned with the way in which each individual responds;

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(1) See Bibliography for further details.

the way in which individual learning develops. This concern has resulted in the growth of in-service training which enables teachers to develop their own professional expertise, and to re-examine, assess and evaluate the effectiveness of their training when it is related to individual needs and standards.

We believe that the way that pupils are regarded by their teachers and the way in which they regard themselves, are crucial aspects of the development of autonomous learning. We have shown, in the case study on the development of autonomous learning in technology, in Part IV of this study, how it is possible for pupils, who have previously been considered non-academic, to develop self-respect in relation to their own capabilities, because of the course's emphasis on individual response. We feel that it is no coincidence that another reason for the success of the technology course with the pupils at Simon Balle school is because they are able to see directly its application to the outside world. Many pupils still spend much of their school lives learning how to cope with failure. As they progress through their schooling it is likely that their sense of inadequacy and failure is constantly being reinforced until they and their teachers build up an expectation of failure. We would like to remind the reader of the rate that a child learns in the first five years of life, and would like to ask the question, is this rapid rate of learning due to an unspoken but shared assumption on the part of adult and child that he or she is expected to learn?

Autonomous learning implies the development of attitudes of responsibility on the part of the learner. It is concerned with the development of what Margaret Donaldson (1978)(1) describes as SELF-AWARENESS related to thought processes. In Part III of this study we have endeavoured to answer the question - How is this development catered for within the context of the school? We believe that the creation of the right sort of learning environment is crucial for the development of autonomous learning behaviour. However we would not wish to imply that contexts for learning are determined solely by the environment, for we believe that they are also affected by the relationship between pupils and their teacher. Despite their changing role, teachers in this context still teach although there is far more reciprocity between teacher and pupil than with the more formal, traditional approaches. A teacher's responsibility to teach is not abnegated in this context indeed their responsibilities are much greater because of the differing demands of individual children.

The Bullock Report "A Language for Life", (1) published in 1975, helped to develop an increasing awareness of the part that language plays in the learning process. It examined the way in which language is not only used in a communicative sense, but also the way in which language is used as an instrument of thought.(2) For it is through language (both spoken and written) that we are able to monitor the development of higher order thought processes. In the report this is described in the following way:

> "... higher processes of thinking are normally achieved by the interaction of a child's language behaviour with his other mental and perceptual powers ... language behaviour represents the aspect of his thought processes most accessible to outside influences including that of the teachers". (p. 49, Chapter 4, para. 6)

The report also advocated the development of language policies throughout schools which involved teachers in looking at what is now called "language across

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(1) See Bibliography for further details.

(2) BRUNER J.S. (1975), Language as an Instrument of Thought - see Bibliography for further details.

the curriculum". This is concerned with the way that language is used in all subjects and has resulted in teachers, of such diverse subjects as science and geography, looking at the particular linguistic demands of their subjects in relation to talking, listening, reading and writing. It has also created a situation in secondary schools where teachers from different subject areas are beginning to discuss with each other areas of common concern.

As has already been indicated elsewhere in this study, value is placed on the development of qualities of responsibility, co-operation and perseverance - these are often acquired by pupils working together in small groups discussing their findings and through such discussion learning from each other. We have already mentioned the reciprocity which is starting to develop between teacher and pupils, this also is a basic feature of collaborative learning in group work which is fostered and developed from the primary stage onwards. By encouraging such ways of working teachers are able, through monitoring children's talk, to listen to the learning taking place.

The development of autonomous learning behaviour involves pupils taking on a large measure of responsibility for themselves. We have talked about the importance of pupils having access to information whether it be from books, folders, slides, filmstrips or cassette tapes. With the development of individualized approaches to learning far more pupils are given the opportunity to develop "resource based learning". Young children in schools today have been born into a technological era. They take for granted equipment such as cassette recorders and projectors and are able to operate them with skill and confidence. The majority of secondary schools in Hertfordshire possess at least one videotape recorder, and many of them also have a video camera which can be used by pupils to make simple video programmes. Pupils are able, by developing such skills, to record and represent their findings in a variety of ways. By extending their knowledge through a wide range of experiences they are able to develop their capacity to make a choice about what, and how, they learn.

The case studies, in Part IV of this study, show how the acquisition of autonomous learning is developed within the context of the school. All the examples show autonomous learning developing within a structured situation. The way that these structures are set up and operated varies according to the organization and type of school, and the individual needs of children at particular stages of their development. Perhaps one of the most inhibiting factors, towards the development of autonomous learning, at the secondary stage, is the way in which the public examination system dictates both the content of the curriculum, and the way in which it is taught. This is mainly because people, in our society, are still judged by their academic achievements. Both parents and pupils desire examination success and it is the responsibility of teachers to lead their pupils towards such goals, whatever their personal educational philosophy.

Many teachers believe that the best possible learning comes from giving pupils greater freedom, greater autonomy. However the pressures of the examination system are such that pupils do not have enough time to learn in this way; although, as the research described in Appendix I shows, the pupils understanding of what he or she has learnt is far more durable. We believe that pupils are able, when learning autonomously, to incorporate what they have learnt into their own stock of knowledge, and are thus capable of relating and applying it in a meaningful way. In Douglas Barnes's[1] terms, through processes of assimilation and accommodation, it becomes a part of their action knowledge, a part of their own world view.

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(1) See Bibliography for further details.

However, as we have shown in Part IV of this study, the examination system is slowly beginning to make provision for greater autonomy in learning. This was first developed with the introduction of Mode 3 C.S.E.(1) examinations and more recently has been incorporated into both the O and A level syllabuses of some Examination Boards.

Although the case studies in Part IV are concerned with the development of autonomous learning within schools, we recognize that a great deal of autonomous learning behaviour is acquired by children out of school. Many teachers know of individual children who have pursued their knowledge and interests out of school to a much greater depth than they could in school. This is primarily because, as we have stated elsewhere in this study, children have more time to pursue their own interests in whatever way they wish. In the out of school context they have time to create their own framework for learning; the desire to learn and find out more comes from within themselves rather than being something which is imposed from without. Examples of this type of autonomous learning behaviour are well documented in "A Kestrel for a Knave" by Barrie Hines (1969)(2) and in "Thunder and Lightnings" by Jan Mark (1976).(2) Both these books show how children who are not usually regarded as high achievers at school are able to learn a great deal in an out of school context given that what they are learning makes sense to them and is a part of what they want to know.

We believe that the development of autonomous learning at any age enables individuals to live richer and fuller lives. Teachers are now being urged to consider the implications of educating their pupils for leisure, as fewer of them will gain employment in the future because of the rapid technological advances of the last decade. It would seem, therefore, to be more appropriate for teachers to channel their energies towards offering pupils far more opportunities to pursue personal interests, rather than preparing them for an examination system which tends to operate in favour of only a minority of the school population.

We believe that the merits of developing autonomous learning behaviour far outweigh the disadvantages. However, as we have shown, much needs to be done before we can say that the majority of children in schools are able to learn in this way.

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(1) See Part II for further details.
(2) See Bibliography for further details.

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APPENDIX I

A report on part of an experiment measuring the effectiveness of three different approaches to learning:

Unsequenced approach, pupils working autonomously.

Programmed text approach, pupils working through a prepared sequence.

Teacher programmed approach, pupils following a structured lesson delivered by the teacher.

Sir James Altham comprehensive school, pupils 11-18 years

Autonomous learning in science

A report on an experiment measuring the effectiveness of three different approaches to learning

In the current academic year 1979/1980 the following experiment was carried out on the whole of the first year intake, one hundred and six pupils, aged 11 years, in order to determine the value of autonomous learning in comparison to other methods. Three topics were chosen the human skeleton, the eye, the ear. This account will only deal with the human skeleton although the pupils dealt with all three topics in rotation.

1. In the first instance all the pupils were given a pre test see attached (a) p 1/2/3 to ascertain their existing knowledge of this topic. Time equivalent to one lesson 35 minutes.

2. Pupils were then given a traditional lesson on the human skeleton by the teacher. The lesson was illustrated by visuals. Time equivalent to one lesson 35 minutes.

3. The year was then divided into six with eighteen boys and girls, able and less able pupils in each group. Two groups being designated Group A, Group B, Group C.

4. Group A (unsequenced) was invited to work autonomously and to find out as much as possible about the human skeleton by consulting books which were made available. They were then asked to write in their own words how the skeleton functions. The teacher was present but offered no help to the pupils.

Titles of some of the books provided for Group A

- How an animal works Professor Hermann Bondi	Pergammon Press reprinted 1974
- Biology Cooke, Burkett and Barker	Longmans 1960
- Biology of mankind C Bibby	Heineman 1970
- Introduction to biology D.G. Mackean	John Murray reprinted 1967

Group B (programmed text) followed a linear programme prepared in advance see attached (b). The teacher present read through the instruction page with the pupils, and noted any questions and by whom they were asked but to offered no help.

Group C (teacher programmed lesson) the teacher gave a planned lesson see attached (c) based on the linear programme, ensuring as far as possible that the pupils understood the structure and functions of the skeleton.

5. All three groups were then given a post test see attached (a) the same as at the beginning of the experiment.

6. A period of four weeks was allowed to elapse no work on the topic the human skeleton was allowed. The three groups were then given a retention test see attached (a) the same test again. All pupils therefore took the same test three times, over a period of five weeks.

Group A unsequenced, see analysis, sheet (d)

1. All pupils increased their learning between pre and post tests, boys learned more than girls.

2. Girls learned less but retained well, in fact showed an increase in their knowledge between the post and retention tests.

Conclusion

All pupils learned from the unsequenced lesson when they were put into a situation of learning autonomously, on average they retained the knowledge and showed an overall increase between post and retention tests.

Group B programmed text, see analysis, sheet (e)

1. All pupils increased their raw score significantly after the programmed text lesson (boys and girls approximately equal).

2. The increase after the retention test was less, showing that retention was poor. Boys retained slightly more of their acquired knowledge than the girls.

Conclusion

The overall increase in learning after the programmed text lesson was considerable, but much of this gain was not retained in the period between the post and retention tests.

Group C teacher programmed lesson, see analysis, sheet (f)

1. All girls showed an increase in knowledge after the teacher programmed lesson, the knowledge gained appeared to be fully retained (but not extended).

2. All boys showed an increase in knowledge after the teacher programmed lesson, a smaller average increase than the girls. The boys' knowledge, too was largely retained, but results show a small loss.

It is important to note that the aims and objectives of the pupils in the three groups A B C were identical although the learning techniques offered to the pupils differed.

As indicated previously the whole experiment included work on the ear and the eye as well as on the skeleton. Conclusions reached in each case were similar to those of the skeleton.

Finally statistical analysis of the results has revealed that differences between the groups A B C can be attributed to the learning techniques employed and not to any other possible factors.

Conclusion

All pupils showed an increase in knowledge after teacher programmed lesson most of this knowledge was retained between post and retention tests.

A summary of the performance of groups A B C can be seen on analysis sheet (g) where it will be noted that:

Pupils who did the linear programmed text lesson made the largest initial improvement in learning. Pupils who followed the unsequenced lesson learned the least.

Overall increase in knowledge was greater in the teacher programmed lesson group and least in the unsequenced group.

The programmed text group did not retain their newly gained knowledge well and lost considerably more than the teacher programmed lesson group. The unsequenced group showed they retained all their gained knowledge, even extended it slightly in some way.

It can therefore be concluded that autonomous learning is a slower process requiring more time. The pupils in the experiment appeared initially to learn less in the unsequenced roup A than in the other two groups but they retained more and the quality of their learning was superior. It would therefore seem that when children acquire knowledge for themselves through their own efforts they do not forget easily this could be an indication for the future.

Acknowledgement to:

Mr. H.E. Harper, ead of science department, Sir James Altham school for permission to write up this research into the appropriate value of learning patterns.

TEST (a)

HUMAN SKELETON

NAME ..... DATE .....

Please answer the following questions:-

1. The human skeleton is made up largely of a hard strong substance called
   a) muscle
   b) bone
   c) skin
   d) cartilage

   Answer .....

2. Which of the following jobs is done by our skeleton
   a) gives our body colour
   b) makes us move parts of our body
   c) gives our body shape
   d) makes us thin or fat

   Answer .....

3. Our bodies are the same shape because
   a) our bones form a framework
   b) our bones are covered in skin
   c) our bones have muscles attached to them
   d) we all have a brain

   Answer .....

4. Our heart is largely protected by
   a) layers of muscle in our chest
   b) layers of fat below our skin
   c) some of the bones of our skeleton
   d) the clothes we wear

   Answer .....

5. What parts of our body are inside our ribs?
   a) stomach
   b) liver
   c) lungs
   d) kidneys

   Answer .....

(a)

6. What important part of our body is in between our lungs?

a) heart
b) liver
c) kidneys
d) stomach

Answer .....

7. What do you think is the most important job done by our skull?

a) make your face look pretty
b) protect your brain
c) enable you to see and hear
d) a place for your hair to grow thickly

Answer .....

8. Which of the following do you think brings about movement of your body?

a) muscles
b) tendons
c) ligaments
d) bones

Answer .....

9. How are muscles joined onto bones?

a) by cartilage
b) by ligaments
c) by tendons
d) by cement

Answer .....

10. If a piece of material contracts, how do you think its appearance will change?

a) it will lengthen and go thinner
b) it will shorten and go thicker
c) it will lengthen and go thicker
d) it will shorten and go thinner

Answer .....

(a)

11. Write down 5 reasons why you think the skeleton is important to you. In other words, what are the 5 main jobs you think the skeleton does for your body.

1. .....

.....

2. .....

.....

3. .....

.....

4. .....

.....

5. .....

.....

(b)

LESSON B

PROGRAMME ON THE FUNCTIONS OF THE HUMAN SKELETON

Instructions

Begin reading Frame 1, then Frame 2, and so on until Frame 36 has been completed.

The programme is designed so that Frame 1 is at the top of page 1, Frame 2 is at the top of page 2, and so on.

Do not answer all the frames on one page in one go; start with Frame 1 and go in numbered order through to Frame 36

Where a gap is left for a word (or words) in a sentence of any frame, these should be filled in with the word (or words) you feel are most appropriate.

The answer you write in these gaps can be checked to see if they are correct or not by looking in the "Answer" column opposite the following frame. (Example: the answer to Frame 7 will be found opposite Frame 8 and so on).

Turn over this page and begin your programme. Remember - begin with Frame 1 on page 1, Frame 2 on page 2, Frame 3 on page 3, and so on.

NAME: .....

(b)

FRAME NO		ANSWER
1	This programme, if followed frame by frame, should explain and enable you to learn the major functions (that is, jobs done by), of the human skeleton.	
	Please turn over the page to frame (2)	
10	The hard strong, bony framework of the skeleton provides ..... for the body and gives it	strong ....
19	One function of the skeleton we have seen to be protection. The skull protects the ....., rib cage protects the ..... and	brain protected .... bone
28	Read the next sentence. There is no answer to make, but new words are being used.	
	Muscles are firmly fixed onto bones by tough chords called tendons	

(b)

FRAME NO		ANSWER
2	The human skeleton is made up largely of a hard, strong substance called bone.	
	Please turn to page 3 for Frame (3)	
11	As well as the hard, strong, bony skeleton providing support and giving shape to the body, it also protects certain parts of the body from possible damage.	shape support
	Please turn to page 3 for Frame (12)	
20	As well as protecting parts of our bodies, the skeleton also gives our bodies ..... and also ..... it.	brain heart and lungs ....
29	'Tendons' are tough chords which firmly fix ..... onto	....

(b)

FRAME NO		ANSWER
3	The skeleton is made up of hard, strong b..... These bones form a framework which gives the body shape and support.	.....
12	The bony skeleton is able to protect certain parts of the body, because bone is ..... and	....
21	In addition to providing support, shape and ....., the human skeleton also aids movement of the body.	shape and support .....
30	Muscles move bones by contracting, (that is shortening and thickening). The muscles are firmly fixed onto the bones by strong chords called t.....	muscles bone .....

(b)

FRAME NO		ANSWER
4	Because the bones of the human skeleton are hard and s..... they make a framework. This framework gives our body a shape and helps to support it.	bones
		.....
13	The ribs are shaped like a cage, and the heart and lungs lie inside this cage. The heart and lungs are therefore p..... because the bony rib cage is hard and strong.	hard and strong
		.....
22	Read the sentences below very carefully. Movement of the skeleton is brought about by structures called muscles. To move bones, muscles have to contract (that is, shorten and thicken). Turn to page 5 for frame (23).	protection
31	The bones of the skeleton help movement then because they provide places where the ..... (which actually move the bones), can fix themselves to.	tendons
		.....

FRAME NO		ANSWER
5	Bones of the human skeleton form a f..... which gives our bodies support and makes us the same basic shape.	strong
		.....
14	Protection for the heart and lungs is given by the bony r..... c..... that surrounds them.	protected
		....
23	Movement of the skeleton is brought about by the contraction (that is the shortening and thickening) of structures called	
		.....
32	As well as helping movement of the body, the skeleton also helps to ..... the body (e.g. rib cage and skull) and also gives us ..... and	muscles
		.... and .....

(b)

FRAME NO		ANSWER
6	The bony framework of the skeleton gives us all the same basic s..... and also supports our body.	framework
		.....
15	The bony rib cage surrounding the h..... and l..... protects them well from possible damage.	rib cage
		h.....
		l.....
24	Muscles contract to move bones. When a muscle contracts, it s..... and thickens.	muscles
		s.....
33	Our bony skeleton gives us a basic shape because the bones form a ..... and supports us because the ..... are hard and strong.	protect shape and support
		....

(b)

FRAME NO		ANSWER
7	All human bodies are the same basic shape, because the bones of the skeleton form a	shape
		.....
16	Inside the skull lies the brain. The skull is made of bone, therefore it ..... the brain inside it from possible damage.	heart and lungs
		.....
25	..... move bones by contracting (that is shortening and thickening.)	shortens
		muscles
34	Due to the bones of the skeleton being hard and strong, they can also provide ..... as well as support.	framework bones
		.....

(b)

FRAME NO		ANSWER
8	Besides giving us shape, the hard, strong bony framework of the skeleton also s..... our bodies.	framework
		.....
17	The hard, strong, protective case of bone surrounding the brain is called the s.....	protects
		.....
26	For muscles to move bones by contracting (that is ..... and .....) they must be firmly fixed onto the bone.	muscles
		.....
		.....
35	Bones of the skeleton also help movement of the body by being the places where the ..... anchor themselves to.	protection
		.....

(b)

FRAME NO		ANSWER
9	The skeleton is able to support and give shape to the body, because bone, of which it is made, is hard and s.....	supports
	Now turn back to page 1 for frame (10)	.....
18	Because the..... is encased inside the bony skull, it is well	skull
	Now turn back to page 1 for frame (19)	....
27	Muscles have to be firmly fixed onto ..... before they can move them by contraction.	shortening and thickening
	Now turn back to page 1 for frame (28)	.....
36	Write down the four main jobs done by the human skeleton by filling in the gaps below:	muscles
	(i) gives the body	.....
	(ii) gives the body	.....
	(iii) gives the body	.....
	(iv) help ..... of the body by providing places where muscles can fix firmly to.	.....
	Check answers overleaf.	.....

(b)

Answers to frame (36) on page 9.

shape
support
protection
(iv) movement

(c)

LESSON C

TEACHER PROGRAMMED LESSON ON THE FUNCTIONS OF THE HUMAN SKELETON

Using slides and diagrams the teacher taught a "traditional lesson" concerning the structure and functions of the skeleton. The same points were covered as in the programmed text but the information about the bones, muscles, tendons and their uses was given by the teacher and reinforced by the question and answer technique. The pupils copied notes and diagrams from the blackboard.

In a "traditional lesson" the pupils have a passive role. They are expected (1) to listen to the teacher talking about a given topic. This can be illustrated by visuals, either slides, diagrams or pictures if the teacher finds they help to emphasize his teaching points. (2) To copy any relevant notes or diagrams from the blackboard. Older children will make their own notes from the information given by the teacher. (3) To answer questions usually in written form on the topic, giving back to the teacher the same information that he provided at the beginning of the lesson.

Although this method of teaching is common in secondary schools it is not successful when there is a spread of ability in the class. The pupils are expected to work and absorb the information being given at the same rate. This is not possible, so weaker pupils become discouraged and more academic pupils become frustrated. In the "traditional lesson" there is no room for enquiry or initiative on the part of the pupil.

GROUP A (d)

ANALYSIS OF UNSEQUENCED GROUPS — HUMAN SKELETON

Girls

Average mark before Unsequenced lesson = 7.6563
Average mark after Unsequenced lesson = 7.9615
Average mark after retention test = 8.4722
Average increase after Unsequenced lesson = + 0.3053
Average increase after retention test = + 0.8160
Increase / decrease between
Post and retention test = + 0.5107

Boys

Average mark before Unsequenced lesson = 7.8000
Average mark after Unsequenced lesson = 8.5313
Average mark after retention test = 8.2143
Average increase after Unsequenced lesson = + 0.7314
Average increase after retention test = + 0.4143
Increase / decrease between
Post and retention test = - 0.3170

Girls and boys together

Average mark before Unsequenced lesson = 7.7258
Average mark after Unsequenced lesson = 8.2759
Average mark after retention test = 8.3594
Average increase after Unsequenced lesson = + 0.5501
Average increase after retention test = + 0.6336
Increase / decrease between
Post and retention test = + 0.0835

GROUP B (e)

ANALYSIS OF PROGRAMMED TEXT GROUP — HUMAN SKELETON

Girls

Average mark before programmed text lesson = 6.7222
Average mark after programmed text lesson = 10.0555
Average mark after retention test = 8.8125
Average increase after programmed text lesson = + 3.33
Average increase after retention test = + 1.2431
Increase / decrease between Post and retention test = - 2.0903

Boys

Average mark before programmed text lesson = 7.6765
Average mark after programmed text lesson = 10.8824
Average mark after retention test = 9.5938
Average increase after programmed text lesson = + 3.2059
Average increase after retention test = + 1.9173
Increase / decrease between Post and retention test = - 1.2886

Girls and boys together

Average mark before programmed text lesson = 7.1857
Average mark after programmed text lesson = 10.4571
Average mark after retention test = 9.2031
Average increase after programmed text lesson = + 3.2714
Average increase after retention test = + 1.2540
Increase / decrease between Post and retention test = - 2.0174

GROUP C (f)

ANALYSIS OF PROGRAMMED LESSON GROUPS — HUMAN SKELETON

Girls

Average mark before programmed lesson	= 7.7000
Average mark after programmed lesson	= 10.8214
Average mark after retention test	= 10.8214
Average increase after programmed lesson	= + 3.1215
Average increase after retention test	= + 3.1215
Increase / decrease between	
Post and retention test	= 0.0000

Boys

Average mark before programmed lesson	= 8.9166
Average mark after programmed lesson	= 11.5000
Average mark after retention test	= 11.3684
Average increase after programmed lesson	= + 2.5834
Average increase after retention test	= + 2.4518
Increase / decrease between	
Post and retention test	= - 0.1317

Girls and boys together

Average mark before programmed lesson	= 8.3636
Average mark after programmed lesson	= 11.2031
Average mark after retention test	= 11.1364
Average increase after programmed lesson	= + 2.8395
Average increase after retention test	= + 2.7727
Increase / decrease between	
Post and retention test	= - 0.0568

(g)

Summary of the performance of Groups A, B and C on the first batch of work on the HUMAN SKELETON

(excluding control group 1.5)

	A UNSEQUENCED GROUP	B PROGRAMMED TEXT GROUP	C TEACHER PROGRAMMED LESSON GROUP
Number of girls	18	18	15
Number of boys	17	17	21
	35	35	36
Average mark on pre-test	7.7258	7.1857	8.3636
Average mark on post-test	8.2759	10.4571	11.2031
Initial increase/ decrease in learning	+ 0.5501	+ 3.2714	+ 2.8395
Average mark on retention test	8.3594	9.2031	11.1364
Final increase/decrease in learning	+ 0.6336	+ 2.0174	+ 2.7727
Retention between post- and retention tests	+ 0.0835	- 1.2540	- 0.0568

APPENDIX II

(a) Design brief

(b) "Nets"

(a)

CREATIVE ACTIVITIES SHEREDES SCHOOL

DESIGN BRIEF

The world population explosion and the growth in scale of urban areas throughout the east and western hemispheres has led to unprecedented shortages of one of mans basic needs, shelter - 'Living Space'.

The present orthodox methods of home design and construction just don't meet demands. This shortage of shelter has led man in recent years to explore alternative means of providing homes, through the use of unconventional materials incorporating unusual forms.

Foremost in these inquiries are experiments into the use of Geometry - cardboard and similar scrap materials to make homes.

You are asked to investigate into Geodesic Dome, Cube and Prism constructions in order to construct a habitat (basic living space for a family of three, parents and 6 year old child). You are required to build a scale model sectioned in order to show interior plan.

WEEK 1 - Introduction. 3D explorations with nets provided. 2D Drawings of exterior shapes and interior sub-divisions.

WEEK 2 - Work on final net -construction of model dome. (Correct model scale vital).

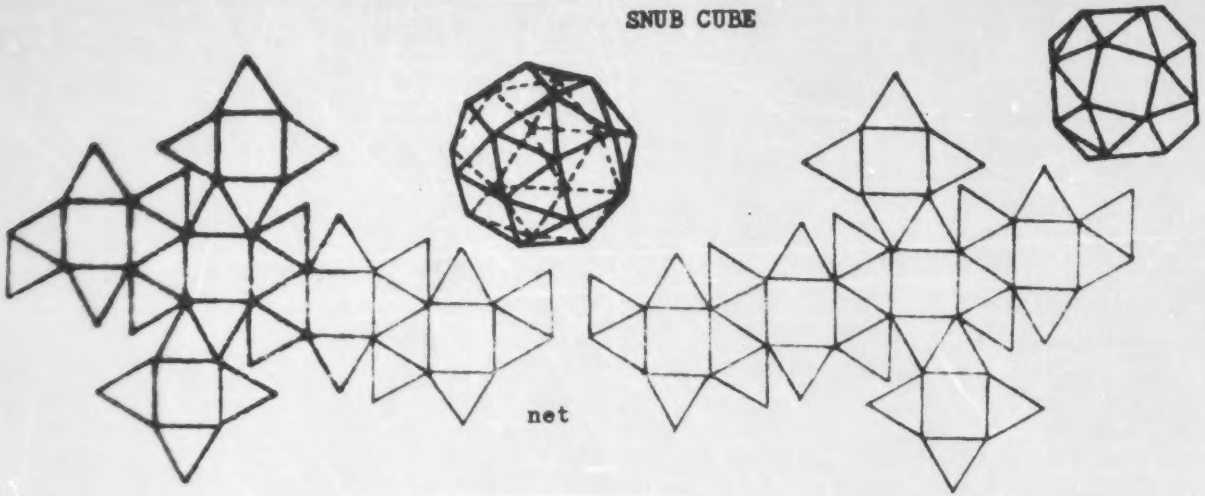
WEEK 3 - Further work on Dome or if necessary Domes. List of living space requirements.

WEEK 4 - Work on interior. Talk on the work of 'Fuller'.

WEEK 5 - Finish models. Criticism.

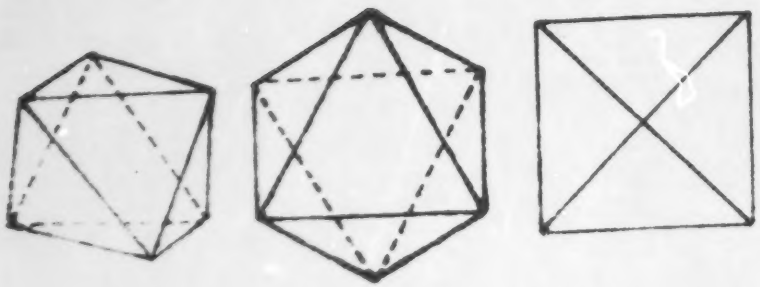
Name	Form
Group	Time Allowance
Rough work completed by	
Final work produced by	
Comments	

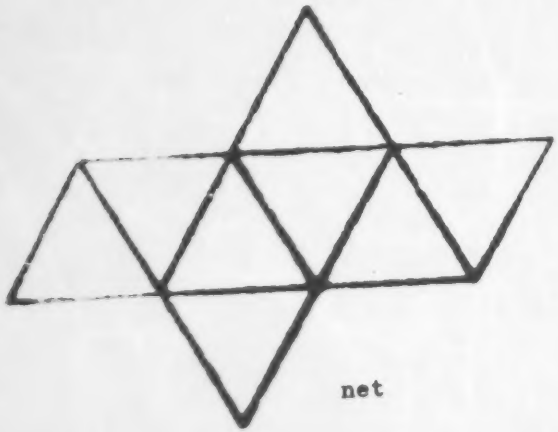
SNUB CUBE



net

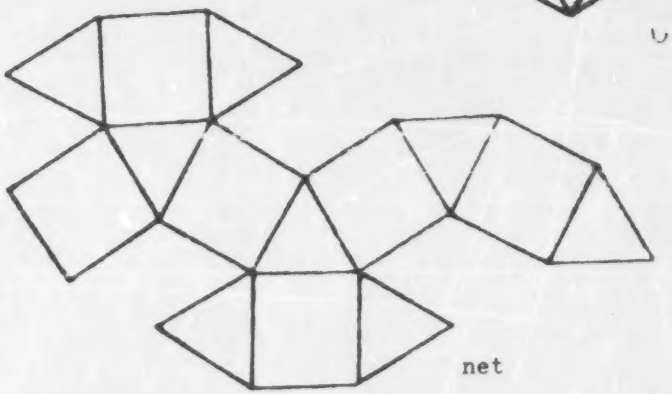
OCTAHEDRON





net

CUBOCTAHEDRON (DYMAXION)



net

APPENDIX III

Instructions for group games

(a) Où va-t-il ?

(b) Est-ce que je peux ?

(c) Aux magasins ?

(d) A quelle heure part l'autobus ?

(e) A "situation" scripted by an eight year old

(a)

GAMES MATERIAL

(a) Où va-t-il — il/elle va à la Madeleine
(6 players) — ils/elles vont au restaurant

Material (i) Large sheet of card 50 cms x 60 cms divided into 12 numbered squares, each with a picture representing a different place which could be visited in Paris. A small circle or dot in the corner of each picture to be coloured red for a feminine noun, blue for a masculine noun.

la Madeleine	le Sacré Coeur
la place de la Concorde	l'Arc de Triomphe
Notre-Dame	les Invalides
La Tour Eiffel	un restaurant
La Conciergerie	un bureau de tabac
Le Louvre	L'Opéra

(ii) Set of cards to be in a pile face down on the table and picked up by each player after throwing the dice. Each card has a symbol, either a boy, or a girl or two boys, or two girls.

(iii) Two dice one of which has the spot indicating No 1 erased or covered.

Aim For the players to become familiar with the names of monuments in Paris and to practice the verb aller in the 1st and 3rd person singular, 1st and 3rd person plural.

Play Player No 1 throws 2 dice and the number registered by the two together will indicate a picture on the board eg. 4. He then turns up the top card of the pile and this will dictate the question he is to answer.

(e.g.) Card with 2 boys Où vont-ils?
answer according to picture 4. Ils vont à la Tour Eiffel.

If the player gives the correct answer he takes a point or a counter. Player with the most counters wins.

NB This game can also be played without the small set of cards with the representative symbols.
Each player can answer the question.
Où vas-tu? or later
Où allons-nous?

(b) Est-ce que je peux
(6 players)

Material (i) A set of 36 question cards each asking a different question but all beginning with "Est-ce que je peux ..."

(eg) Est-ce que je peux visiter la Tour Eiffel?

Est-ce que je peux prendre le métro?

Est-ce que je peux acheter des cartes postales?

(ii) A set of 10 cards, each with one word, either "Oui" or "Non".

(iii) An egg timer which gives a 4 minute limit.

Aim To give practice with est-ce que je peux + the infinitive and to increase reading speed.

Play The question cards are dealt to the players who place them on the table in front of them face up. As soon as the egg timer is set in motion the players in turn read aloud a question from one of the cards in front of them. One player holds the permission cards and will reply "Oui" or "Non" according to the card on the top of his pile. If the answer is "non" the player leaves his card in position and must read it again, if "oui" the card is turned over and a point has been gained. Points are counted at the end of 4 minutes when the sand has run out. Speed is essential in this game.

(c) **Aux Magasins**
(2 players)

je voudrais .... s'il vous plaît

Material (i) A card 24 cms x 24 cms divided into 9 squares of 8 cms each. Each square with a picture representing a souvenir that the players might wish to purchase in Paris.
Une cravate, une bouteille d'eau de cologne, des mouchoirs.

(ii) 9 cards 8 cms x 8 cms with identical pictures to the above but also with prices. Plastic money and notes can be used if available.

(iii) A small circle or dot in the corner of each picture to be coloured red for a feminine noun, blue for a masculine noun, helps to eliminate mistakes in gender when players are not with an adult.

Aim To give practice in shopping dialogues.

Play Players work in pairs, they decide which one is the shopkeeper and which one is the customer. The customer has the large card with 9 pictures the shopkeeper the set of small ones. The dialogue below can be modified by the children and either the "vous" or "tu"form used.

Shopkeeper	Bonjour, Madame (Monsieur) Qu'est-ce vous désirez?
Customer	Bonjour, Madame Je voudrais une cravate rouge s'il vous plaît.
Shopkeeper	Voici des cravates rouges
Customer	Je préfère celle-ci
Shopkeeper	Bien Madame, la voilà ça fait 24 francs.
Customer	Merci, voilà 30 francs
Shopkeeper	Merci Madame je vous rends 6 francs.

The shopkeeper gives the small card to the customer who puts it on the large card, this completes the first dialogue. The customer then continues until all 9 articles have been purchased.

(d) A quelle heure part l'autobus
(6 players)

Material (i) A large sheet of card 50 cms x 60 cms for the base with as big a circle as possible divided into 16 sections. Pictures of Paris monuments in the outer part of each section. A small circle or dot in the corner of each picture to be coloured red for a feminine noun or blue for a masculine noun.

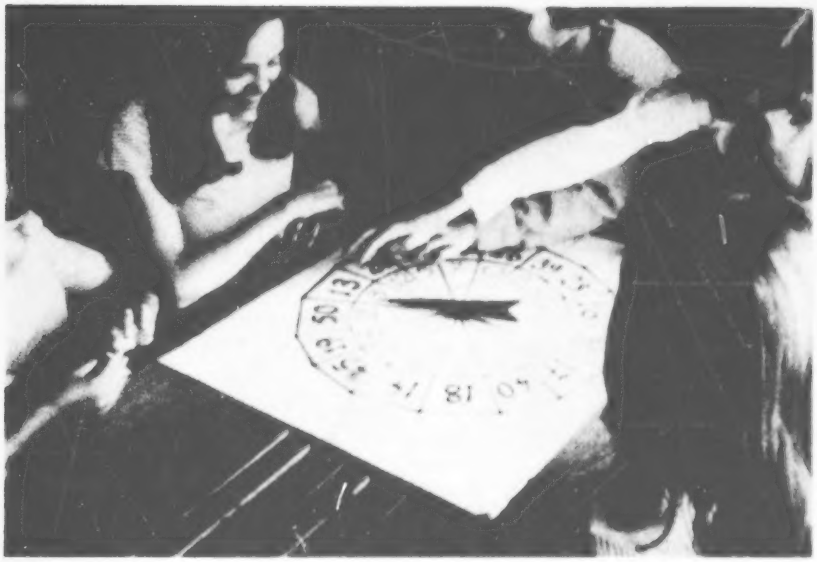
(ii) A smaller card circle divided into 16 sections each with a different time of day using the 24 hour clock (eg) 13.20.

(iii) Half a cork should be stuck to the centre of the large sheet of card, the small card circle should now be attached to this with a straight pin. This circle will now revolve. Care should be taken so that the inner circle does not cover up any of the pictures on the base card.

Aim To give practice in the question and answer as follows
"A quelle heure part l'autobus pour la Madeleine?"
Il part à treize heures vingt.

Play Player No 1 will look at the board, choose a place and ask player No 2 a question (eg) "A quelle heure part l'autobus pour La Gare du Nord?"

Player No 2 will spin the inner circle and give the answer according to the time indicated when the circle stops. The time being that on the inner circle opposite the picture of the Gare du Nord. "Il part à dix heures quarante" It is now the turn of Player No 2 to put a question to Player No. 3. In this way each player has the opportunity of giving an answer and asking a question. When an adult is present points may be given for correct answers.



CHILDREN PLAYING A FRENCH BOARD GAME

(e)

MARC B

Philippe bon-fete (Gives present)

Luc merci Phillipe (knock on door)

Luc Ouvrir la porte

Phillipe Ah say C.D
Comoi sa va?

Luc Sava bea merci. bon-fete luc

MARC Kei age a tu

Luc joi wheito

Walla un cade

Phillipe keska say

Ovrir la bat

Luc Say un line mercy

MARC Walla un jaer

[Luc] mercuy say un soldat

Phillippe Walla quatre (4) chaise. Assay vous.

[illegible] de chocolates? de fruites?

[illegible] une pomme, s'il vous play.

[Marc] Rela (Knock at door)

Phillippe Ah say mama

All together Ofwa maruy